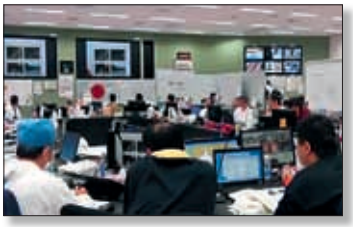
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NUCLEAR ENERGY AGENCY
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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Foreword

This issue of the *Nuclear Law Bulletin* covers the time frame during which a devastating earthquake and tsunami hit Japan and caused a very serious nuclear accident at the Fukushima Daiichi nuclear power plant. It equally covers the time when the world marked the 25th anniversary of the accident at the Chernobyl nuclear power plant in Ukraine on 26 April 1986.

These two accidents represent the most difficult moments in the history of civilian nuclear power production. Following Chernobyl, the national and international nuclear communities undertook several important steps to improve both the safety and security of nuclear activities. As a result, governments, nuclear regulators and the industry itself have been able to demonstrate continual improvement in the governance, operation and management of civilian nuclear activities. Clearly, though, more still needs to be done.

It is too soon for the legal community to draw lessons from the Fukushima accident and so they cannot be addressed in a comprehensive fashion in this issue of the *Nuclear Law Bulletin*. We can, however, provide our readers with a summary of what has been achieved by the international legal community in the last 25 years in the hopes that it will help open a debate on the need (or otherwise) of improvements to international nuclear law.

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International nuclear law in the 25 years between Chernobyl and Fukushima and beyond…

*by Selma Kuş**

This issue of the *Nuclear Law Bulletin* opens with a paper dedicated both to legal developments since the accident at the Chernobyl nuclear power plant 25 years ago and possible legal implications of the accidents at Fukushima Daiichi which occurred after Japan was struck by a devastating earthquake on 11 March 2011.

Following the accident at Three Mile Island in 1979 and at Chernobyl in 1986, Fukushima will be remembered as the third major accident in the history of civilian nuclear power reactors. Yet Chernobyl was and remains the worst trauma in this history as a result of which nuclear developments slowed down significantly. Eventually, the industry emerged as a safer and stronger technology, particularly because the 25 years between Chernobyl and Fukushima were marked by an exceptional national and international commitment to nuclear safety and emergency preparedness so as to prevent accidents and minimise potential damages, if such occur. From a legal point of view it is safe to say that the nuclear industry is one of the most strictly regulated. However, it is equally safe to say that there is no zero risk technology and that accidents can happen.

For several weeks after the tragic events in Japan the world's focus turned – justifiably so – to the Fukushima Daiichi nuclear power units. It was nevertheless astonishing to observe that the real tragedy, the terrible loss of lives, swept away villages, and the chaos following the breakdown of all kinds of infrastructure were treated as a sideshow compared with the dramatic images of explosions at the Fukushima Daiichi units and helicopters trying to drop seawater into the spent fuel pools. The live broadcasting of accidents might present one of the first lessons to be learnt in our internet and 24-hour news channel era which did not exist at the time of Chernobyl.

The international legal community will also face challenges as the accident has put 25 years of international co-operation and international nuclear law-making to its first serious test. The question will be if, where and how the international legal regime governing peaceful nuclear activities showed weaknesses. There is no room for the hasty setting up of new conventions; there are, however, lessons to be learnt which in turn will lead to the improvement of the international legal framework. It will take time and effort to understand and process the events. While this paper is being written, the reactors at Fukushima have yet to be stabilised; nevertheless a first glance at the key legal issues will be attempted.

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A. International nuclear law in the post-Chernobyl period

Fukushima has been classified at the same level on the International Nuclear and Radiological Event Scale (INES)[1] as Chernobyl, i.e. level 7 which represents a major accident with widespread health and environmental effects. However, the explosion at Unit 4 in Chernobyl remains the most serious and devastating accident in the history of civilian nuclear power. Two and a half decades on, the international community continues to help Ukraine, which inherited the site from the former Union of Soviet Socialist Republics (USSR), finish the so-called new safe confinement, a permanent safety shelter, and a long-term spent fuel storage facility.[2]

Although the accident in 1986 revealed significant gaps in the international legal framework, Chernobyl does not mark the beginning of international co-operation and law-making. The creation of the International Committee on Radiological Protection dates back to 1928, the key international organisations for intergovernmental co-operation were established in the 1950s,[3] and international instruments had been adopted in the realms of non-proliferation of nuclear weapons,[4] physical protection,[5] radiation protection[6] and liability for nuclear damage.[7]

Chernobyl was, however, a "wake-up"[8] call for the international nuclear community and eventually facilitated international co-operation in fields that were until then strictly protected by individual states as falling under their sovereign jurisdiction, such as emergency management, nuclear safety and radioactive waste management; it also led to important improvements of the international third party liability instruments as a result of which the situation on 11 March 2011 was very different compared to that on 26 April 1986.

This section carries the title of a joint report by the OECD Nuclear Energy Agency (OECD/NEA) and the International Atomic Energy Agency (IAEA), published in 2006 on the occasion of the 20th anniversary of the accident at the Chernobyl nuclear power plant.[9] For the details, readers are referred to the contributions in that publication. What is more interesting in a paper published 25 years after Chernobyl,

1. INES is a tool for promptly communicating to the public in consistent terms the safety significance of reported nuclear and radiological incidents and accidents. The primary purpose of INES is to facilitate communication and understanding between the technical community, the media and the public on the safety significance of events (INES User's Manual, 2008 Edition, co-sponsored by the IAEA and the OECD NEA).
2. The latest Chernobyl Pledging Conference took place on 19 April 2011 in Kiev; representatives provided EUR 550 million, the largest single contributor being the European Commission.
3. United Nations Scientific Committee on the Effects of Atomic Radiation (1955), International Atomic Energy Agency (1957), European Atomic Energy Community (1957), OECD Nuclear Energy Agency (1958).
4. 1968 Treaty on the Non-Proliferation of Nuclear Weapons.
5. 1979 Convention on the Physical Protection of Nuclear Material.
6. 1960 IAEA Basic Safety Standards.
7. 1960 Paris Convention on Nuclear Third Party Liability, 1963 Brussels Supplementary Convention on Nuclear Third Party Liability, 1963 Vienna Convention on Civil Liability for Nuclear Damage.
8. Rautenbach, J., Tonhauser, W., Wetherall, A., "Overview of the International Legal Framework Governing the Safe and Peaceful Uses of Nuclear Energy – Some Practical Steps –", *International Nuclear Law in the Post-Chernobyl Period*, p. 7.
9. *International Nuclear Law in the Post-Chernobyl Period*, a joint report by the OECD Nuclear Energy Agency and the International Atomic Energy Agency, OECD, Paris 2006, available free of charge at www.oecd-nea.org/law/chernobyl/ in English and at www.oecd-nea.org/tools/publication?id=6147 in French.

and notably shortly after the accident at Fukushima, is whether the post-Chernobyl international legal framework corresponds to the international nuclear community's needs in 2011 and beyond.

B. International nuclear law in the post-Fukushima period?

The focus of the following section will be to examine where the regime does not respond to the realities of today, limited to the three areas of emergency preparedness and response, nuclear safety and nuclear third party liability.

Emergency preparedness and response

What had been considered as "unattainable"[10] in the area of emergency preparedness and response since the 1960s was, as a matter of fact, attained within only four months following the accident at Chernobyl. Based on existing non-legally binding guidelines,[11] the international community, under the auspices of the IAEA, adopted two legally binding conventions:

- the Convention on Early Notification of a Nuclear Accident[12] (Notification Convention) and
- the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency[13] (Assistance Convention).

The two conventions provide the legal basis for the notification by a state to the IAEA and other states party to the convention of nuclear accidents and the provision of assistance as and when requested by the state in which the nuclear accident or radiological emergency occurred.[14]

The scope of the two conventions is restricted to the time period immediately following an accident which is why the later negotiated and adopted Convention on Nuclear Safety[15] includes a provision on emergency preparedness. Article 16 of that instrument requires contracting parties to test their on-site and off-site emergency plans routinely and to take the appropriate steps to ensure that their own population and the competent authorities of states in the vicinity of the affected nuclear installation are provided with appropriate information for emergency planning and response.

Finally, at the European level two Council instruments deal with radiological emergencies, one on arrangements for the early exchange of information in the event of a radiological emergency[16] and another on informing the general public

10. Rautenbach, J. *et al.*, *op. cit.*, p. 9.
11. Guidelines for Mutual Emergency Assistance Arrangements in Connection with a Nuclear Accident or Radiological Emergency (IAEA document INFCIRC/310 of 1984); Guidelines on Reportable Events, Integrated Planning and Information Exchange in Transboundary Release of Radioactive Materials (IAEA document INFCIRC/321 of 1985).
12. INFCIRC/335, 18 November 1986.
13. INFCIRC/336, 18 November 1986.
14. For the details see Moser, B., "The IAEA Conventions on Early Notification of a Nuclear Accident and on Assistance in the Case of a Nuclear Accident or Radiological Emergency", *International Nuclear Law in the Post-Chernobyl Period*, *op. cit.,* p. 119 *et seq*.
15. INFCIRC/449, 5 July 1994.
16. Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency (OJ L 371, 30 December 1987, pp. 76-78).

about health protection measures and steps to be taken in the event of a radiological emergency.[17]

The list of instruments could be extended by the practical arrangements, manuals and exercises that have been adopted and carried out respectively in the course of the 25 years following the accident at Chernobyl. These are highly useful practical tools that constitute an international nuclear emergency preparedness and response system, and include the Inter-Agency Committee on Response to Nuclear Accidents,[18] the IAEA's Incident and Emergency Centre (IEC),[19] manuals,[20] the OECD NEA's Working Party on Nuclear Emergency Matters[21] and finally exercises such as the OECD NEA's series "International Nuclear Emergency Exercises" (INEX).[22] These important features in emergency management are due, on the one hand, to a strong commitment by the international community, and on the other hand, because many of these arrangements are designed to facilitate the implementation of the above mentioned legally binding conventions.

On looking through the Notification and Assistance Conventions, the following issues qualify for further debate with a view to amending these instruments.

Notification Convention

- Strengthening and harmonisation of the national and international response

The fundamental precept of all international initiatives is that "states have the ultimate responsibility to protect life, health, property, the environment and quality of life on their territories."[23] The transboundary effects of the accident at Chernobyl and the total absence of information and communication between affected states led to increased efforts regarding the establishment of communication mechanisms between states.

The accident at Fukushima has underlined, however, how vital it is to first and foremost strengthen the domestic emergency response system which, in turn, will help other states and the international community to appreciate the accident state's decisions and to better react to emergency situations. Although national response

17. Council Directive 89/618/Euratom of 27 November 1989 on informing the general public about health protection measures to be applied and steps to be taken in the event of a radiological emergency (OJ L 357, 7 December 1989, pp. 31-34).
18. The purpose of this committee is to co-ordinate the arrangements of the relevant international organisations in preparing for and responding to nuclear and radiological emergencies. The committee is convened and chaired by the IAEA and brings together the following organisations: the IAEA, the OECD NEA, the European Commission (EC), the UN Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), the European Police Office (EUROPOL), the UN Food and Agriculture Organization (FAO), the World Health Organization (WHO), the International Civil Aviation Organization (ICAO), International Maritime Organization (IMO), the International Criminal Police Organization (INTERPOL), the Pan American Health Organization (PAHO), the UN Environment Programme (UNEP), the UN Office for the Co-ordination of Humanitarian Affairs (UN/OCHA), the UN Office for Outer Space Affairs (UN/OOSA) and the World Meteorological Organization (WMO).
19. The IEC is the "focal point for preparedness and response to nuclear and radiological incidents and emergencies irrespective of their cause"; see the centre's website at www-ns.iaea.org/tech-areas/emergency/incident-emergency-centre.asp.
20. Emergency Notification and Assistance Technical Operations Manual (EPR-ENATOM 2007), Emergency Response Network Manual.
21. Working Group of the NEA's Committee on Radiation Protection and Public Health.
22. The OECD NEA's Committee on Radiation Protection and Public Health has conducted three such exercises since 1993, the fourth of which will be finalised by the end of 2011.
23. Joint Radiation and Emergency Management Plan of the International Organizations, EPR-JPLAN (2010), p. 14.

mechanisms might vary, Fukushima has shown that a certain level of confidence in the decisions of the accident country is crucial to avoid contradictory recommendations and orders to citizens. Although the concept of "an accident anywhere is an accident everywhere" remains true, the reaction of other countries regarding their nationals in the accident country and/or potential transboundary damage should be consistent with the accident state's decisions in order to maintain the credibility of all responders. In turn, the accident country must, if it does not wish other states to second guess what has happened, be fully transparent so as to reassure the international community of the sufficiency and legitimacy of its decisions.

In this respect, at the latest review meeting held in April 2011 some contracting parties to the Convention on Nuclear Safety proposed to harmonise the approach to decision making in emergency situations.[24] A code could help regulatory authorities to understand various approaches and to "speak with one voice" instead of calling into question each other's decisions.

- Role of the media/internet in the 21st century

What has entirely changed since Chernobyl is the communication and information technology. While in 1986, the accident was covered mostly on state run TV channels, the radio and print media, today reporting takes place live and on a 24-hour basis on both TV channels and the internet, giving the public the immediate possibility of asking questions, commenting and criticising. As in every other field, the nuclear world has adapted to these changes at all levels: international organisations, national regulatory bodies, technical support organisations, operators and others have websites on which they disseminate comprehensive information regarding their activities.

These are developments that do not necessarily require the permanent updating of legal frameworks. There are, however, provisions in the Notification Convention that require some modernisation because the concept of the convention no longer corresponds to today's communication flow. It reflects the 1986 achievement that the accident state "calls" the IAEA, which in turn provides the information to other physically affected states. This was meant to relieve the accident country from the burden of having to notify one country after another at a time with limited communication tools.

Today, after an initial alert to the IAEA, continuous information on the accident can be directly disseminated to the IAEA, all affected states and the media instantly and at once through modern information sharing tools. The IAEA remains the focal point for information exchange but the information flow foreseen by the convention no longer reflects the reality by which, through websites, information provided to the media and population are both facilitated and accelerated.[25]

- Requirement of transboundary risks justified?

Under the Notification Convention, the fundamental legal justification for the obligation to inform is the risk of "transboundary radiological consequences".[26] An accident of the magnitude of Fukushima will always and certainly fall under that

24. No. 42 of the Summary Report of the 5th Review Meeting of the Contracting Parties to the Convention on Nuclear Safety, held from 4 to 14 April 2011 at the IAEA in Vienna, Austria.
25. Tools, such as the Early Notification and Assistance Conventions Website (ENAC) and the Nuclear Event Web-based System (NEWS), operated by the IEC could be reflected in the convention.
26. Preamble, Article 1(1), Article 5(1)(c), (e), (f) of the Notification Convention.

category even if the transboundary release of radioactive material remains limited. The focus on transboundary effects has again its origins in the experience following Chernobyl when increased radioactivity levels were detected all over Europe. Fukushima might change that focus.

Although international instruments and obligations derive their legitimacy on the basis of protecting states from activities that take place outside their borders and beyond their control or influence, in the nuclear field the international community's need to be informed arises even if the damages will almost certainly remain within the borders of one state. Here again, the convention could be changed to reflect that states do in fact inform the IAEA even of events the consequences of which would (geographically) remain very limited.[27] The motivation could be to assist or to simply exchange lessons learnt or to monitor long-term effects on the environment. The removal of the prerequisite of possible "transboundary radiological consequences" would also be consistent with the Assistance Convention which naturally does not require the risk of transboundary radiological consequences in order for a country to request assistance.

- Subject of notification

The obligation to notify and inform according to the Notification Convention arises when there is a "nuclear accident" involving a facility or activity from which a release of radioactive material occurs or is likely to occur and which may result in an international transboundary release.[28] The plants and activities concerned are listed in Article 1(2). The list does not include plants and activities for military purposes. It is left to the discretion of states parties[29] to notify other states of any nuclear accident caused by, for example, the testing of nuclear weapons. The extension of the scope of the convention to the military applications of nuclear energy is politically illusory.

However, there are other fields that could be included in its scope of application. What is not related to the accidents at the Fukushima nuclear power plants, but should be considered during any possible revision process, is the inclusion of incidents related to "terrorism and the increased threat of malicious acts involving radioactive material or devices or attacks against nuclear facilities".[30] Here again, it is only a matter of bringing the Notification Convention into line with reality, given that the IAEA's Incident and Emergency System does cover nuclear and radiological emergencies resulting from criminal or intentional unauthorised acts.[31]

Assistance Convention

- "Call" for assistance

For several weeks after the devastating earthquake and tsunami in Japan, we felt helpless watching the images of the Fukushima units and thinking of the

27. See "Publications on Accident Response" with a listing of past accidents with radiological consequences at www-pub.iaea.org.
28. Article 1(1) of the Notification Convention.
29. Article 3 of the Notification Convention.
30. Tonhauser, W. and Wetherall, A., "The International Legal Framework on Nuclear Safety: Developments, Challenges and Opportunities", *International Nuclear Law: History, Evolution and Outlook, 10th Anniversary of the International School of Nuclear Law*, OECD, Paris, 2010, p. 160.
31. See "International Action Plan for Strengthening the International Preparedness and Response System for Nuclear and Radiological Emergencies", according to which the term "nuclear or radiological emergency" includes emergency situations or events resulting from accidents, negligence or malicious acts, Footnote 1 of the report.

"50 heroes"[32] trying to prevent the worst case from happening. In the immediate aftermath of the accident and the emergency response phase, the Assistance Convention did not seem to fulfil its objective, namely the "prompt provision of assistance".[33] As of June 2011, the Assistance Convention counts 105 contracting parties. Although, there is no legally binding international obligation to assist under the convention, the understanding is that one country alone is incapable of coping with a nuclear catastrophe and that a concerted approach is necessary to help minimise the consequences of an accident on individuals, the environment and property.

However, the decisive word in the Assistance Convention on which the entire mechanism depends is the "call" for assistance as set out in Article 2. Although this concept might have prevented states from providing prompt assistance, there is no alternative to it since everything else would lead to chaos. Assistance cannot be imposed on a country; it is perfectly rational that assistance must be requested as help can quickly turn into a burden if it is not needed or cannot be co-ordinated. The accident country alone knows if, when, from whom and what kind of assistance it needs and is able to co-ordinate.

From the legal point of view, the mechanism of assistance upon request must be maintained but the contracting parties should be encouraged to revisit the provisions of the convention in order to abolish possible obstacles to the request for assistance and to support states' "calling" for such assistance quickly.[34]

- Nature of assistance

The Assistance Convention does not specify in detail the nature of the assistance since such will depend on the individual case. The state requesting assistance has to specify the scope and type of assistance and, where practicable, provide the assisting party with such information as may be necessary for that party to determine the extent to which it is able to meet the request [Article 2(2)]. However, for better preparation of assistance capacities, states could, in advance, provide as much information as possible on the design of their nuclear power plants and the emergency management plans applicable to accidents at those plants. Basic information could be collected at a central database, maintained by the IAEA, so that the design features of every single nuclear power plant in the world[35] are quickly accessible, including emergency plans, etc. Such a function could be added to the list in Article 5(a) of the Assistance Convention ("Functions of the Agency").

32. On 15 March 2011, the press reported that the operator had withdrawn its staff from the Fukushima units, except for 50 workers who remained in the plant to prevent a nuclear disaster, see e.g. *New York Times* report entitled "Last Defense at Troubled Reactors: 50 Japanese Workers". The Japanese Government in its Report of June 2011 to the IAEA Ministerial Conference on Nuclear Safety states that as of 23 May 2011, 7 800 people entered the Fukushima Daiichi site, available at www.kantei.go.jp/foreign/kan/topics/201106/pdf/chapter_vii.pdf.
33. Preamble of the Assistance Convention.
34. Approximately 30 countries and international organisations offered assistance to Japan. Based on the needs in the emergency response situation, Japan received supplies and equipment from 10 countries and 2 international organisations. See Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety – The Accident at TEPCO's Fukushima Nuclear Power Stations, June 2011, *op. cit.,* Chapter VII.
35. This is feasible bearing in mind that there are 440 nuclear power plants in operation (as of June 2011).

- Incentive to request assistance – was reimbursement of costs/liability an obstacle?

The basic understanding of the Assistance Convention seems to be that the assisting party offers assistance without costs to the requesting state. The accident state shall, however, reimburse the assisting state "promptly" if and when it presents a request for reimbursement, although the assisting party is free to waive or agree to the postponement of the reimbursement (Article 7).

Further, post-accident emergency management activities might cause damage on the territory of both the requesting and the assisting state (personal injury, property damage, damage to the environment, etc.). Article 10(2)(a)-(d) of the Assistance Convention provides that unless otherwise agreed and except in cases of wilful misconduct by the individuals who cause the damage, a requesting state shall in respect of death or of injury to persons, damage to or loss of property, or damage to the environment caused in the course of providing the assistance requested:

- not bring any legal proceedings against the assisting party or persons or other legal entities acting on its behalf;
- assume responsibility for dealing with legal proceedings and claims brought by third parties against the assisting party or against persons or other legal entities acting on its behalf;
- hold the assisting party or persons or other legal entities acting on its behalf harmless in respect of legal proceedings and claims referred to in sub-paragraph (b); and
- compensate the assisting party or persons or other legal entities acting on its behalf for:
  - death of or injury to personnel of the assisting party or persons acting on its behalf;
  - loss of or damage to non-consumable equipment or materials related to the assistance.

At first glance, it seems justified that the state which benefits from the help of another state should not, in addition, be able to claim for compensation against the assisting state.

Yet these very provisions might delay, complicate or even hinder the request for assistance. It might indeed turn out that one obstacle to the immediate request for assistance by the Japanese authorities (or the operator) was to avoid reimbursement of costs and/or the risk of additional damages caused by foreign teams that are exempted from liability. In light of the costs incurred by the international community after the Chernobyl disaster, it might be more acceptable to distribute costs claimed by an assisting state, including liabilities related to the assistance, amongst all contracting parties with operating nuclear power plants.

Contracting parties might wish to revisit these provisions and replace them with a mechanism which ensures that economic issues do not stand in the way of international solidarity.

Matters of relevance to both conventions

- Confidentiality

Following the accident at Fukushima and during the emergency management activities, the call for information throughout the world was enormous to say the

least. Once again, it was evident that quick and comprehensive information provided by official channels is crucial. In light of the Fukushima experience, legal and technical experts might revisit the list in Article 5(1) of the Notification Convention in order, for example, to relieve the notifying state from the obligation to provide information that is available elsewhere (e.g. "meteorological conditions"). On the other hand, the exception in Article 5(3) of the Notification Convention which provides that information received from the accident country may be used without restriction, "except when such information is provided in confidence" by a notifying state party may lead to a distorted view of the convention, particularly because the information to be provided according to Article 5(1)(a)-(h)[36] does not pose risks in terms of security. Contracting parties might either wish to remove this confidentiality clause or specify precise reasons for which a state may restrict the use of information.

It is true that following the attacks of 11 September 2001, the tendency to full transparency challenged lawyers insofar as this notion is not always compatible with that of confidentiality. However, today transparency is accepted as a rule whereas confidentiality is the exception which needs justification;[37] the plain wish of a notifying state to withhold information appears arbitrary. The transparency provided by the Notification Convention remains a milestone in openness and communication among contracting parties which should not be thwarted by such "secrecy" clauses.

Similarly, the Assistance Convention's provision on confidentiality and public statements (Article 6) does not correspond to today's attitudes regarding access to information, public participation and transparency. Article 6(2) of the convention according to which the assisting party shall co-ordinate with the requesting state before releasing information to the public on the assistance provided might be understandable in light of sensitivities after Chernobyl; however, since that time much progress has been made on transparency issues which should be reflected in the convention.

- Points of contact

Both conventions require that each state party communicate to the IAEA its competent authorities and points of contact for notification and information under the Notification Convention (Article 7) and for requests under the Assistance Convention (Article 4). Such points of contact shall be available continuously. While the internet cannot replace human beings as contact points, technological progress will, to a great extent, facilitate the continuous availability and the speed of information exchange.

The Notification and Assistance Conventions do not include provisions on financial and human resources. Although the functions of contact points are limited, the conventions could call upon its states parties to set aside minimum financial and human resources to ensure that those tasks are carried out by qualified staff with appropriate education, training and language skills.

36. Time, exact location, nature of the nuclear accident; the facility and activity involved; the assumed and established cause and the foreseeable development of the nuclear accident relevant to the transboundary release of the radioactive materials; the general characteristics of the radioactive release; information on meteorological and hydrological conditions; the result of environmental monitoring; the off-site protective measures taken or planned; the predicted behaviour over time of the radioactive release.
37. See Article 4(3) of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters; Article 36 of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management.

- The licence holder

The Notification and Assistance Conventions do not oblige contracting parties to ensure that the licence holder of an installation is responsible for the immediate notification of public entities in charge of emergency management of any accident/incident or alert the contact point of any assistance that it needs to cope with a nuclear or radiological emergency situation.

The functioning of both conventions will largely depend on the emergency response "culture" of the operator and its transparency *vis-à-vis* public institutions. Notification and assistance will only be possible if the communication between the operator and the contact points is ensured. Even though it might go without saying, the contracting parties should be required to ensure the responsibilities of the licence holder where they need its collaboration to meet their obligations under the conventions.

Nuclear safety

The safety of nuclear power plants has been at the heart of international co-operation since Chernobyl. The 1994 Convention on Nuclear Safety (CNS)[38] represents a milestone in this period. The 1997 Joint Convention[39] constitutes a further landmark instrument in international nuclear law in the realm of safety. Finally, with Council Directive 2009/71/Euratom establishing a Community framework on the nuclear safety of nuclear installations, a third legally binding "safety" instrument was realised at the European level. In addition, there are innumerable safety guides, standards, assistance programmes and conferences launched and held respectively under the auspices of international and regional organisations in order to set up, maintain and enhance a high level safety culture within participating nations.

International legal instruments are often set up as a response to major catastrophes which trigger immediate international co-operation in order to send a "signal". Chernobyl is one such example where *ex post* the question was whether the catastrophe could have been prevented by better legal frameworks.[40] Fukushima has and will continue to trigger similar reactions: on 7-8 June 2011, on the initiative of the French President and Chair of the G8 together with the OECD Nuclear Energy Agency, an international ministerial meeting on nuclear safety took place which was followed by a Forum on the Fukushima Accident organised by the OECD NEA's Committee on Nuclear Regulatory Activities; on 20 to 24 June 2011, a ministerial conference on nuclear safety was held at the IAEA and in 2012, an extraordinary meeting of the contracting parties to the CNS will be convened to name but a few immediate reactions.

These events might result in the sending of strong signals. However, the following section will look at the issues arising from the legal instruments in the field of nuclear safety.

38. The convention was opened for signature on 20 September 1994 and entered into force on 24 October 1996.
39. The Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management was opened for signature on 29 September 1997 and entered into force on 18 June 2001.
40. Jankowitsch-Prevor, O., "The Convention on Nuclear Safety", *Nuclear Law Bulletin No.* 54 (1994/2), p. 10.

Convention on Nuclear Safety

The CNS is the cornerstone of the international legal framework on nuclear safety.[41] It is a legally binding international instrument which does not stipulate detailed safety standards but rather, fundamental safety principles for land-based nuclear power plants.[42]

These fundamental principles relate to the legislative and regulatory framework (Article 7), the regulatory body (Article 8), responsibility of the licence holder (Article 9), priority of safety (Article 10), financial and human resources, human factors (Articles 11, 12), quality assurance (Article 13), assessment and verification of safety (Article 14), radiation protection (Article 15), emergency preparedness (Article 16), siting (Article 17), design and construction (Article 18) and operation (Article 19).

Notably the implementation and enforcement provisions are characteristic of the convention's incentive nature.[43] According to Articles 5, 20 *et seq*. of the convention, contracting parties are to hold review meetings prior to which they shall submit a report on the measures they have taken to implement each of the obligations under the CNS. During the review meetings, contracting parties have the opportunity to discuss the reports of other contracting parties and to seek clarification. To date, five such triennial review meetings have been conducted, i.e. in 1999, 2002, 2005, 2008 and in 2011. The latest review meeting was held very shortly after the accident at Fukushima, as a result of which participants were invited to include the following nine topics into their discussions:[44]

1. Nuclear power plant design against external events;
2. Off-site response to emergency situations (e.g. station blackout);
3. Emergency management and preparedness following worst case accident scenarios;
4. Safety consideration for operation of multi-units at the same nuclear power plant site;
5. Cooling of spent fuel storage in severe accident scenarios;
6. Training of nuclear power plant operators for severe accident scenarios;
7. Radiological monitoring following nuclear power plant accident involving radiological release;
8. Public protection emergency actions;
9. Communication in emergency situations.

The discussion of these issues has only started and it will take time before conclusions can be drawn and actions implemented in individual installations. It remains to be seen if at the end of the discussions a need to amend the CNS will be expressed in order to reflect new technical achievements at the legal level.

The question is related to the famous difference in pace between scientific and technological developments on the one hand and legal developments on the other hand. Nuclear safety is not a static notion, it is work in progress and will always

41. Tonhauser, W. and Wetherall, A., *op. cit.*, p. 160.
42. Preamble (viii); detailed safety standards are left to the non-legally binding guidelines, see list of IAEA's Safety Standards Series at www-ns.iaea.org/standards/documents/pubdoc-list.asp?s=11&l=96.
43. Preamble (vii); Jankowitsch-Prevor, O., *op. cit.*, p. 13.
44. No. 12 of the 2011 Summary Report.

remain a dynamic concept[45] for which licence holders and states must permanently aim at enhancing the *status quo*. However, this does not mean that laws have to keep pace with technological developments. Rather, they have to provide a general framework which will assure both longevity and foresight for scientific and technological progress.

The CNS represents such a framework, striving for a high level of nuclear safety worldwide, Article 1(i). The negotiation of the convention took a considerable period of time[46] which might be one reason why its concept, goals, structure and provisions remain appropriate even 17 years following its adoption.

From a legal point of view, it is less the individual provisions that need a critical review than the practical implementation and enforcement mechanisms of the convention.

- Review meetings

Periodic multilateral conferences have become a standard means for reviewing implementation of legal instruments in the nuclear field.[47] As opposed to domestic law systems, international law lacks clear enforcement mechanisms to guarantee compliance, in particular because the addressees of international instruments are sovereign states.[48] It is thanks to the incentive character of international nuclear instruments, and the absence of sanctions and penalties, that they enjoy large adherence. As of June 2011, there are 72 contracting parties to the CNS, including all states with operating nuclear power plants.

Over the years, the self-assessment and mutual learning process during review meetings has led to significant improvements in the nuclear safety framework of contracting parties. However, it is an open secret that as a legal enforcement tool the peer review mechanism is weak: first there are no sanctions if a contracting party does not submit a national report and/or does not send representatives.[49] Secondly, it is in the contracting party's discretion to determine how complete, and indeed how accurate, its national report will be; in other words the state itself reports whether or not it complies with the provisions of the convention.[50] Since 1999, contracting parties underline in each summary report that they have to rely on the accuracy and completeness of the information provided in the national reports.[51] The philosophy of self-assessment and mutual encouragement to achieve a high level of nuclear safety in the most diplomatic language is too vague and soft given the importance of the subject matter (nuclear safety!). Thirdly, too much emphasis has been placed on the formal and procedural obligations of the convention. According to Article 4 of the CNS, however, contracting parties are required to first of all implement the substantive obligations. Fourthly, it is regularly stressed that the review process is neither intended to be nor is the right place to review the

45. Pelzer, N., "Nuclear New Build – New Nuclear Law?", *Nuclear Law Bulletin No. 84* (2009/2), p. 5 *et seq*.
46. Jankowitsch-Prevor, O., *op. cit.*, p. 7 *et seq*.
47. Stoiber, C., "The Review Conference Mechanism in Nuclear Law: Issues and Opportunities", *Nuclear Law Bulletin No. 83* (2009/1), p. 5 *et seq*.
48. *Ibid*., p. 25.
49. In 1999, 45 out of 50 contracting parties participated; in 2002: 46 out of 53; in 2005: 50 out of 55, in 2008: 55 out of 61 and in 2011: 61 out of 72.
50. See No. 22 of the 2011 Summary Report: "A high degree of compliance with the provisions of the Convention was reported by the Contracting Parties in the National Reports".
51. See No. 6 of the 1999 Summary Report; No. 9 of the 2002 Summary Report; No. 7 of Attachment I of the 2005 Summary Report; No. 8 of the 2008 Summary Report; No. 20 of the 2011 Summary Report. All summary reports are available on the IAEA's website at www-ns.iaea.org/conventions/nuclear-safety.asp.

safety of individual nuclear installations.[52] This is understandable in light of the number of participants and the issues on the agenda; however, if contracting parties are deprived of the possibility to discuss substantive safety issues in regard to individual nuclear installations, the CNS becomes an abstract instrument remote from the real issues concerning nuclear safety. Finally, more work has to be done in terms of outreach as well as openness and transparency; national reports should, for example, be made publicly available as a rule.[53]

After having completed five successful review meetings bringing together nuclear safety experts from all around the world, the continuation of the peer review mechanism is in the interest of all participating countries. It would be desirable, however, if the Fukushima experience would change the diplomatic and abstract language of the meetings to a more substantive language, where contracting parties commit to implement concrete safety measures, e.g. in respect of the nine Fukushima related subjects listed above. An accident in a highly industrialised country might also change the focus of future meetings; the international community might have spent a bit too much energy on emerging nuclear countries and neglected to continue efforts in developed countries with "advanced" nuclear programmes. The accident, however, illustrated that no country in the world can allow itself to grow complacent and that the review meetings should be regarded by all as a chance to learn and to implement lessons learnt.

- Article 6 of the CNS

Despite its watered-down language, Article 6 of the Convention on Nuclear Safety represents the most far-reaching provision of the convention. It reads:

> "Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact."

Historically, Article 6 was aimed at Central/Eastern Europe and states of the former Soviet Union with reactors of Russian design ("post-Chernobyl Convention"). Eleven such reactors were, for example, located in the former German Democratic Republic, either in operation or under construction. In the early 1990s, they were all either shut down or the construction work was discontinued.

The provision is exemplary of the maximum compromise that can be reached at an international conference aiming at the inclusion of a wide variety of states, especially those with old and potentially distressing designs. However, its application is by no means restricted to states that were part of the former Soviet Union; it is general and applies to every contracting party in the same way.

Today, and in particular after Fukushima, the perception of this provision might change to reflect the view that all nuclear power plants, no matter what their design and their location, fall under this provision and that "worrying" reactors are no

52. See e.g. No. 20 of the 2011 Summary Report.
53. Only if contracting parties agree, the IAEA publishes national reports on its website at www-ns.iaea.org/conventions/nuclear-safety.asp. In 1999, 23 national reports were published; in 2002: 28; in 2005: 32; in 2008: 32; and in 2011: 26 reports (so far).

longer acceptable and must be shut down, applying the most "drastic" measure of the convention.

So far, only the European Union, during the latest accession processes in 2004 and 2007, has been able to oblige acceding states to shut down nuclear power plants; one such example is the permanent closure of the Ignalina nuclear power plant in Lithuania on 31 December 2010.[54]

- Integrated Regulatory Review Service (IRRS) and Operational Safety Review Team (OSART)

As mentioned above, the review process under the CNS is not intended to review the safety of individual nuclear installations. One could add that it is equally not intended to review in detail the effectiveness of the national regulatory infrastructure of contracting parties. To this end, there are practical but voluntary services.

The Integrated Regulatory Review Service (IRRS) is a team composed of experts from different IAEA member states who conduct a regulatory review process by comparing the nuclear and radiation regulatory infrastructure in a host state against international standards and guidance.[55] As a result of these missions, recommendations and suggestions are usually offered to the host country.

The Operational Safety Review Team (OSART)[56] is also an international team of experts which conducts reviews of operational safety performance at a nuclear power plant, covering, *inter alia*, the subjects: management, organisation and administration; training and qualification; operations; maintenance; technical support; operational experience feedback; radiation protection; emergency planning and preparedness.

In the aftermath of Fukushima, the use of these services will hopefully become an unwritten law. Contracting parties from the European Union have, at the last CNS review meeting, reported on their intention to invite IRRS missions in fulfilment of an obligation for periodic peer reviews under the European Directive on Nuclear Safety.[57]

Council Directive 2009/71/Euratom of 25 June 2009

As of June 2011, there are 143 operating nuclear power plants in 14 member states of the European Union the safety of which is subject to the 2009 Council Directive establishing a Community framework on the nuclear safety of nuclear installations (Nuclear Safety Directive).[58]

From the inception of the European Atomic Energy Community in 1957 until 2009, there was no legislative framework on the safety of nuclear installations at the European level. In 1986, the EU counted 12 Western European member states which might be one reason why a nuclear catastrophe did not trigger EU legislation on nuclear safety. The enlargement of the EU to 27 member states, ambitious EU targets related to the reduction of greenhouse gas emissions, the need for diversification of

54. See Article 1 of Protocol No. 4 of the Accession Treaty where Lithuania committed "to the closure of Unit 1 of the Ignalina Nuclear Power Plant before 2005 and of Unit 2 of this plant by 31 December 2009 at the latest and to the subsequent decommissioning of these units". It did so on condition of financial assistance promised by the Community for the decommissioning of the plant, OJ L 236, 23 September 2003, p. 944.
55. IRRS website is available at www-ns.iaea.org/reviews/op-safety-reviews.asp?s=7&l=49.
56. OSART website is available at www-ns.iaea.org/reviews/op-safety-reviews.asp.
57. No. 32 of the 2011 Summary Report.
58. OJ L 172 of 2 July 2009.

the EU's energy mix and other issues have, 23 years after Chernobyl, led to the adoption of a Nuclear Safety Directive at the European level.

The directive is a legally binding instrument, addressed to all 27 member states of the European Union. It entered into force on 22 July 2009 and must be transposed into national legislation by 22 July 2011.[59]

Its provisions are based on the Convention on Nuclear Safety and are similarly general in nature. However, the directive does not have the same weaknesses on the implementation and enforcement side. The European Commission and the Court of Justice of the European Union will guard over the adequate implementation and observation of its obligations by member states.

Articles 6(2) and (3) and Article 9(3) of the Nuclear Safety Directive are interesting to read in light of the European Union's reaction to the Fukushima accident.

Article 6(2) of the directive obliges member states to ensure "that the national framework in place requires licence holders, under the supervision of the competent regulatory authority, to regularly assess and verify, and continuously improve, as far as reasonably achievable, the nuclear safety of their nuclear installations in a systematic and verifiable manner". This assessment "shall include verification that measures are in place for prevention of accidents and mitigation of consequences of accidents, including verification of the physical barriers and licence holder's administrative procedures of protection that would have to fail before workers and the general public would be significantly affected by ionizing radiations", Article 6(3) of the directive. According to Article 9(3), member states "shall at least every 10 years arrange for periodic self-assessments of their national framework and competent regulatory authorities and invite an international peer review of relevant segments of their national framework and/or authorities with the aim of continuously improving nuclear safety".

An outlook on a directive which has just been adopted is difficult, particularly when the deadline for the transposition of the directive by member states has not even passed (22 July 2011). It is, however, safe to say that the instrument will strengthen European Commission initiatives in the field of nuclear safety. The first such initiative was taken when the European Commission, immediately after the accidents at Fukushima, announced the reassessment of all 143 nuclear power plants in the European Union. On 25 May 2011, the European Commission and the member states' regulators, through ENSREG,[60] agreed to carry out the so-called "stress tests" from 1 June 2011 onwards.[61]

In terms of content, the tests will be "a targeted reassessment of the safety margins of nuclear power plants in the light of the events which occurred at Fukushima: extreme natural events challenging the plant safety functions and leading to a severe accident".[62]

59. More on the directive and its background: Garribba, M., Chirteş, A. and Nauduzaite, M., "The Directive Establishing a Community Framework for the Nuclear Safety of Nuclear Installations: The EU Approach to Nuclear Safety", *Nuclear Law Bulletin No. 84* (2009/2), p. 23 *et seq.*; Pouleur, Y. and Krs, P., "The Momentum of the European Directive on Nuclear Safety – From the Complexity of Nuclear Safety to Key Messages Addressed to European Citizens", *Nuclear Law Bulletin No. 85* (2010/1), p. 5 *et seq.*
60. The European Nuclear Safety Regulators Group (ENSREG) is composed of senior officials from the national nuclear safety, radioactive waste safety or radiation protection regulatory authorities from all 27 member states in the European Union and representatives of the European Commission; its website is accessible at www.ensreg.org.
61. Press Release Rapid IP/11/640 of 25 May 2011.
62. http://ec.europa.eu/energy/nuclear/safety/doc/20110525_eu_stress_tests_specifications.pdf.

One weakness of the Nuclear Safety Directive might be that it is based on the CNS, an international treaty that has not been amended since its adoption in 1994. The European framework might risk becoming an equally static instrument. Although immediately after the accident, the European Council called on the European Commission to review the existing legal framework on nuclear safety and propose possible improvements by the end of 2011,[63] it remains to be seen if Europe is more flexible in light of new lessons following the accident at Fukushima. Another weakness might be that the directive imposes similar reporting obligations as under the CNS [see Article 9(1) of the directive]. The risk with such a mechanism is that European institutions (European Commission, Council and Parliament) may content themselves with the self-assessments made by member states in their reports instead of insisting on the implementation of the substantive provisions of the directive.

Third party liability

Instruments in the field of nuclear third party liability were developed long before the Chernobyl disaster. In fact, the very first international instrument in that field was negotiated and adopted under the auspices of the European Nuclear Energy Agency (today Nuclear Energy Agency), this being the 1960 Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960 (1960 Paris Convention).[64] Since that time the picture of international instruments in the realm of third party liability has become both more varied and more complex. Chernobyl, in particular, was the impetus to significantly improve the international third party liability regime.

For in-depth information on nuclear third party liability, reference is made to essays which notably the OECD Nuclear Energy Agency has published over the years in the *Nuclear Law Bulletin* and elsewhere.[65] The regime and chronology of instruments can be summarised as follows.

Under the auspices of the OECD Nuclear Energy Agency, some of its member countries have established the so-called Paris/Brussels regime:

- 1960 Paris Convention on Nuclear Third Party Liability (Paris Convention);[66]
- 1963 Brussels Supplementary Convention on Nuclear Third Party Liability (BSC);[67]

63. See the conclusions of the European Council of 24/25 March 2011, p. 11, available at www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/120296.pdf.
64. As amended by the Additional Protocol of 28 January 1964 and by the Protocol of 16 November 1982.
65. Schwartz, J., "Liability and Compensation for Third Party Damage Resulting from a Nuclear Incident", *International Nuclear Law: History, Evolution and Outlook, 10th Anniversary of the International School of Nuclear Law*, OECD, Paris, 2010, p. 307; Pelzer, N., "Main Features of the Revised International Regime Governing Nuclear Liability – Progress and Standstill", *ibid.*, p. 355; Schwartz, J., "International Nuclear Third Party Liability Law: The Response to Chernobyl", *International Nuclear Law in the Post-Chernobyl Period*, *op. cit.*, p. 37; McRae, B., "The Convention on Supplementary Compensation for Nuclear Damage: Catalyst for a Global Nuclear Liability Regime", *Nuclear Law Bulletin No. 79* (2007/1), p. 17; Dussart Desart, R., "The reform of the Paris Convention on Third Party Liability in the Field of Nuclear Energy and of the Brussels Supplementary Convention", *Nuclear Law Bulletin No. 75* (2005/1), p. 7; Lamm, V., "The Protocol Amending the 1963 Vienna Convention", *Nuclear Law Bulletin No. 61* (1998/1), p. 7; von Busekist, O., "A Bridge Between two Conventions on Civil Liability for Nuclear Damage: the Joint Protocol relating to the Application of the Vienna Convention and the Paris Convention, *Nuclear Law Bulletin No. 43* (1989/1), p. 10.
66. Fifteen contracting parties: Belgium, Denmark, Finland, France, Germany, Greece, Italy, Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Turkey, United Kingdom.

- 2004 Protocol to amend the Paris Convention (not yet in force);[68]
- 2004 Protocol to amend the BSC (not yet in force).[69]

Under the auspices of the IAEA, some of its member states have established the so-called Vienna regime:

- 1963 Vienna Convention on Civil Liability for Nuclear Damage (Vienna Convention);[70]
- 1997 Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage (Vienna Protocol);[71]

As a bridge between the two regimes and in order to extend the privileges of countries party to the Paris Convention to countries party to the Vienna Convention (and *vice versa*) a new instrument was adopted:

- 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Joint Protocol).[72]

Finally, the 1997 Convention on Supplementary Compensation for Nuclear Damage (CSC; not yet in force)[73] was adopted under the auspices of the IAEA to constitute both a basic liability and compensation regime for those countries which are not already party to either the Paris or Vienna Conventions, as well as a supplementary funding instrument which could be used by all countries including those already party to either the Paris or Vienna Conventions.

All of these regimes assure compensation in the event of a nuclear accident causing damages to third parties. They channel liability to the operator of the nuclear power plant, impose strict liability and fix minimum and/or maximum liability amounts for which the operator must maintain financial security (notably through insurance).[74] These regimes are well established and suitable for dealing with the compensation of nuclear damage. However, at the same time they are imperfect[75] and not entirely satisfactory,[76] and they will face major challenges following the accident at Fukushima.

67. Twelve contracting parties: Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Slovenia, Spain, Sweden, United Kingdom.
68. Sixteen signatories (all contracting parties to the Paris Convention and Switzerland).
69. Thirteen signatories (all contracting parties to the BSC and Switzerland).
70. Thirty-eight contracting parties, see list at www.iaea.org/Publications/Documents/Conventions/liability_status.pdf.
71. Nine contracting parties: Argentina, Belarus, Kazakhstan, Latvia, Montenegro, Morocco, Poland, Romania, Saudi Arabia.
72. Twenty-six contracting parties, see list at www.iaea.org/Publications/Documents/Conventions/ jointprot_status.pdf.
73. Four contracting states: Argentina, Morocco, Romania and the United States.
74. See for details regarding these principles list of essays in Footnote 65, see for insurance Reitsma, S. and Tetley, M., "Insurance of Nuclear Risks", *International Nuclear Law: History, Evolution and Outlook, 10th Anniversary of the International School of Nuclear Law*, OECD, Paris, 2010, p. 387; regarding alternatives to insurance see Pelzer, N., "International Pooling of Operators' Funds: An Option to Increase the Amount of Financial Security to Cover Nuclear Liability?", *Nuclear Law Bulletin No. 79* (2007/1), p. 37.
75. Schwartz, J., "Liability and Compensation for Third Party Damage Resulting from a Nuclear Incident", *op. cit.*, p. 339.
76. Pelzer, N., "Nuclear New Build – New Nuclear Law?", *op. cit.*, p. 16 *et seq*.

Far away from a global regime

It is telling that the first serious accident after Chernobyl happened in a country not party to any international third party liability regime. Fortunately, Japan has solid national third party liability legislation[77] and it seems that transboundary nuclear damage from the Fukushima accident will be limited.

Nuclear accidents have the potential of causing widespread damage that know no geographical or political borders and that can detrimentally affect humans, the environment, property and the economy. The main purpose of the international third party liability regimes is to provide for the compensation of transboundary damage on a non-discriminatory basis. As of June 2011, there are 440 nuclear power plants in 30 countries throughout Europe, Asia, North and South America. Further, there are 64 nuclear power plants under construction and finally, numerous states have shown strong interest in embarking upon a nuclear power programme at a later stage. The fact is that out of the 440 nuclear power plants, only 197 are subject to international nuclear liability convention that is in force. Once the Convention on Supplementary Compensation (CSC) enters into effect, the United States with 104 operating nuclear power plants will fall under that regime. India has signed the CSC[78] but other major states, such as Canada, China, Japan and Korea have not yet committed to adhere to any convention in this field.

Fukushima might encourage non-convention states to adhere to one of the modernised conventions so that their population, too, can benefit from their advantages. If not, they will be exposed to the legal uncertainties of private international law, such as forum shopping and the choice of law and the difficulties posed by national tort law, such as proof of negligence or intention to do harm.

Entering into force

Twenty-five years after Chernobyl, fourteen years after the adoption of the CSC and seven years after the adoption of the 2004 Protocols to amend the Paris/Brussels regime, those enhancements have not entered into force. As a result, the situation has not changed much since 26 April 1986.

If the "Fukushima" accident had occurred in a state which is a contracting party to either the Paris/Brussels or the Vienna regime, the respective conventions in force would have provided for the following: for contracting parties to the Paris/Brussels regime[79] the maximum liability amount legally required is 300 million Special Drawing Rights (SDR).[80] The 1963 Vienna Convention provides for USD 5 million as a minimum amount and in practice many of its contracting parties have not legislated for higher amounts.[81] The 1997 Vienna Protocol requires its contracting parties to impose a minimum liability amount of SDR 300 million[82] but only 9 countries are party to it. All of these amounts give a deplorable image to the international third party liability regimes.

77. See following article by the OECD Nuclear Energy Agency's Legal Affairs Section, "Regulatory and Institutional Framework in Japan against the Background of Fukushima", p. 27 *et seq*.
78. India signed the CSC on 27 October 2010; however, ratification may prove to be difficult since India's recently adopted (but not yet in force) national legislation does not provide for legal channelling of liability to the operator of a nuclear installation, which is one of the basic principles upon which the convention is founded.
79. Article 7(b) of the Paris Convention; Article 3(b) of the BSC, 1990 Decision of the Steering Committee for Nuclear Energy, OECD/NEA document [NE/M(90)1].
80. 1 SDR equals 1.1 EUR and 1.6 USD (22 June 2011).
81. Article V of the Vienna Convention.
82. Article V(1)(a) of the 1997 Vienna Protocol.

The increased liability amount under the revised Paris/Brussels regime at EUR 1.5 billion is not yet in force and thus irrelevant if an accident were to happen today. The same applies to the Convention on Supplementary Compensation which under its first tier provides for SDR 300 million and under its second tier (assuming all major nuclear power generating countries are party) another SDR 300 million.[83]

In order for the 2004 Paris Protocol to enter into force, it must be ratified, accepted or approved by two-thirds of the contracting parties. The 2004 Protocol to amend the BSC will enter into force when all contracting parties have ratified, accepted or approved it. A difficulty which many signatories face is that, as member states of the European Union, they are bound to deposit simultaneously their instruments of ratification of the Paris Protocol.[84] However, there is reason to remain optimistic that this will happen soon because the great majority of signatories to both protocols are well on their way towards ratifying, accepting or approving those instruments and implementing them into national law.[85]

For the CSC to enter into force it must be ratified, accepted or approved by at least five states with a combined minimum of 400 000 units installed nuclear capacity.[86]

The tragic events in Fukushima have illustrated how urgent the entering into force of these enhanced instruments is. It is hoped that the process of ratification will be accelerated, in particular because now nuclear energy has the attention of politicians and every effort should be made to move forward quickly in this process.

Unlimited liability

Even before the first nuclear accidents in civilian nuclear power reactors took place, it was well known how devastating the effects of their occurrence could be. What has changed, however, is the role of the nuclear industry which, since its creation in the 1950s, has become a strong and viable private sector business player. While in those early days, states limited the liability of nuclear operators as a means to encourage investment in the industry, today subsidies to the nuclear sector are highly unpopular. And still the limitation of liability has been maintained in most countries with the exception of Austria, Germany, Japan and Switzerland. More countries, so it looks, will follow the example of Germany *et al.* in imposing unlimited liability, such as Denmark, Finland[87] and Sweden.[88]

It is well understood that there can be no financial security for unlimited liability and that the means to compensate damages will always be limited. However, many nuclear operators run a strong business, as was clearly demonstrated in the case of the operator of the Fukushima Daiichi units, the Tokyo Electric Power Company (TEPCO). With an unlimited liability regime in Japan, there may be economic obstacles to the compensation of victims, but there should be no legal ones.

83. Articles III and IV of the CSC.
84. Article 2 of Council Decision 2004/294/EC of 8 March 2004.
85. Schwartz, Julia A., "Liability and Compensation for Third Party Damage Resulting from a Nuclear Incident", *op. cit.*, p. 335 *et seq.*
86. Article XX(1) of the CSC.
87. Finland's parliament passed a bill (temporarily until the entering into force of the act implementing the 2004 Protocols) to adopt unlimited liability for damage originating and occurring in Finland following the events in Fukushima; the amendments will enter into force on 1 January 2012.
88. The new Swedish Law on Liability and Compensation for Nuclear Damage, published on 13 July 2010, SFS 2010:950 (not yet in force) imposes unlimited liability on the operator.

C. Conclusions

The ultimate goal of 25 years of international co-operation since Chernobyl was to prevent a nuclear accident from happening again. This failed. In addition, the international community had committed to combine efforts to mitigate the consequences of accidents should such occur. At Fukushima, the communication between the operator, the government and the international community showed that more work needs to be done in order to ensure that no country, even if it is one of the most technologically advanced in the world, will have to cope with a nuclear catastrophe alone.

The fact finding and understanding processes have only started. The lessons learnt will differ depending on the individual who is drawing them. Politicians, regulators, operators, suppliers, lawyers, engineers, radiation experts, victims, nuclear opponents, etc., will all have a role to play in the appreciation and evaluation of the accident.

This paper has focused on specific issues in the international legal framework but in concluding, reference to some very important policy statements[89] is pertinent because these might, at some point in the future, be incorporated into a new or newly amended legal instrument:

- Both regulators and operators have understood that it is unacceptable to grow complacent and that they should never stop questioning safety measures.
- They reiterated commitment to the highest levels of safety through continuous improvement.
- Regulators have announced systematic, methodical and rigorous reviews of nuclear power plants through strong peer reviews with international participation.
- In technical terms, priority areas for the advancement of knowledge were identified: resilience to extreme natural events, combined risks, plant design and the ability of safety systems to withstand severe accidents, the issue of multiple units at one site, the safety of spent fuel pools, emergency response and management capabilities, crisis communication, site recovery plans and their implementation, etc.
- The importance of transparency and openness was emphasised at all levels, in particular, regarding adequate tools to communicate with the public on accident severity, including the International Nuclear and Radiological Event Scale (INES).
- Finally, regulatory authorities undertook to continue and increase international co-operation.

Three months after the tragic accident at Fukushima Daiichi, there seems to have been a fair degree of progress. This must in the months and years ahead translate into action so as to enhance nuclear safety throughout the world and regain public confidence in the safety of nuclear activities.

89. See for example OECD/NEA press release NEA/COM(2011)4 of 8 June 2011.

Regulatory and institutional framework in Japan against the background of Fukushima

by the Legal Affairs Section of the OECD Nuclear Energy Agency

On 11 March 2011, Japan endured one of the worst natural disasters in its history when a massive earthquake hit the Pacific coast of the country, followed by a tsunami, which led to a terrible loss of lives. It also led to serious accidents at the Fukushima Daiichi nuclear power units which the Japanese authorities classified at level 7 on the International Nuclear and Radiological Event Scale (INES),[1] indicating the worst possible accident.

This paper summarises the regulatory and institutional framework governing nuclear activities in Japan for a better understanding of both the applicable legislation and the responsible authorities in the field of radiological protection, nuclear safety, emergency management and nuclear third party liability.

The information is based on three authoritative sources that are acknowledged at the beginning so as to limit the number of references throughout the paper:

- OECD Nuclear Energy Agency's "Nuclear Legislation in OECD Countries", Chapter on Japan;[2]
- Japan's report to the 5th review meeting of the contracting parties to the Convention on Nuclear Safety;[3] and
- Report of the Japanese government to the IAEA Ministerial Conference on Nuclear Safety of June 2011.[4]

The accident will trigger a review of international and national approaches to nuclear safety and emergency management as well as the underlying legal and regulatory frameworks but first, it will result in a thorough examination of laws and practices in Japan. Following the accident, the Japanese government established the Nuclear Incident Investigation and Verification Committee which will not only examine technical aspects, but will comprehensively review such factors as human resources, organisations, institutions, as well as the safety culture.[5]

1. INES is a tool for promptly communicating to the public in consistent terms the safety significance of reported nuclear and radiological incidents and accidents. The primary purpose of INES is to facilitate communication and understanding between the technical community, the media and the public on the safety significance of events (INES User's Manual, 2008 Edition, co-sponsored by the IAEA and the OECD/NEA).
2. www.oecd-nea.org/law/legislation/.
3. www.nisa.meti.go.jp/oshirase/2010/files/220831-2-2.pdf.
4. www.kantei.go.jp/foreign/kan/topics/201106/iaea_houkokusho_e.html.
5. Speech of Japanese Prime Minister, Naoto Kan, at the Commemoration Ceremony of the 50th Anniversary of the OECD on 25 May 2011 in Paris, France, available at www.kantei.go.jp/foreign/kan/statement/201105/25oecd_e.html.

A. Background – what happened?

On 11 March 2011, at 2:46 pm local time, a magnitude 9.0 Mw on the Richter scale earthquake hit the eastern coast of Japan. The epicentre was at 150 km north-east of the two Fukushima sites, at a depth of approximately 24 km.[6] The Onagawa nuclear site was the closest to the epicentre, at approximately 80 km distance. Eleven reactors, most affected by the earthquake, shut down immediately. From the six units at the Fukushima Daiichi site, three shut down automatically and the other three units were undergoing inspection and were therefore not in operation at the time of the earthquake. At approximately 3:38 pm, a tsunami hit the eastern coast of Japan; the wave which hit the Fukushima site was between 14 and 15 meters in height.

The Fukushima Daiichi site on the Pacific coast of Japan accommodates six boiling water reactors[7] which were designed by General Electric and started commercial operation between 1971 and 1979. Units 1 to 5 have Mark-1 containment design and unit 6 has a Mark-2 containment design. Each unit is designed with several safety structures to protect workers, the public and the environment; these include systems to shut down the reactor quickly, thereby stopping the fission process, systems to cool the fuel in the reactor and carry heat away from it, and finally barriers to contain the radioactivity and prevent it from escaping into the environment.[8]

When reactors are shut down, the heat which continues to be generated within the reactor is no longer from the fission process, but primarily due to the radioactive decay of fission products (decay heat).[9] At Fukushima, cooling was needed to remove this decay heat which is a small fraction of normal operating power. For about one hour following the earthquake and the loss of off-site electrical power, the emergency diesel generators operated and provided electrical power to the systems for decay heat removal. With the loss of the diesel generators, cooling to the fuel in the core was provided by systems that did not require electric power. At unit 1 an isolation condenser system is included in the design for cooling in this situation. However, this system was not available immediately following the loss of electrical power due to damage to equipment caused by the tsunami. At unit 2 the reactor core isolation cooling system was used over the next several days in an attempt to remove decay heat and it was assumed to have shut down at about 1:25 am on 14 March 2011. At unit 3 the reactor core isolation cooling system and the high pressure coolant injection system were used to cool the fuel until about 2:42 am on 13 March 2011.[10]

With the loss of the isolation condenser, reactor core isolation cooling, and the high pressure coolant injection systems, a marathon followed to restore the cooling of the reactors and to ensure the flow of water in order to keep the fuel covered. It was in this context that the decision was made to inject seawater into the reactor vessel. However, even with these efforts significant fuel melting occurred at units 1, 2, and 3.

6. Epicentre: 38°6''N and 142°51''E.
7. Unit 1: BWR-3; units 2, 3, 4, 5: BWR-4; and unit 6: BWR-5.
8. www.nrc.gov.
9. The following technical information is based on Nakoski, J. and Lazo, T., "Fukushima", *NEA News*, June 2011.
10. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety – The Accident at TEPCO's Fukushima Nuclear Power Stations, June 2011, Chapter IV, pp. 50, 65 and 82 (main chronologies for units 1, 2, and 3 found in Tables IV-5-1, IV-5-2 and IV-5-3 respectively).

On 11 April 2011, Japan's Nuclear and Industrial Safety Agency decided to classify the accident and the radiological consequences at 7 on INES.

The technical details of the accident have been presented in detail and in a clear and comprehensive fashion by the Japanese government, international organisations, technical support organisations, regulatory bodies and, one has to acknowledge, even by a large fraction of the general media which is why this article will move on to the institutional and legal framework governing radiological protection, nuclear safety, emergency management and third party liability in Japan.

B. The institutional framework – who's who in Japan?

A brief summary of the institutional framework in Japan in the field of nuclear energy will help understand the steps taken by the various institutions after the accident at the Fukushima Daiichi nuclear power site.

International instruments in the field of nuclear energy almost certainly require the setting up of regulatory bodies.[11] The Convention on Nuclear Safety (CNS) requires, in addition, "an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy", Article 8(2) of the CNS.

The Japanese government acknowledged that the multiplication of organisations and structures hindered the mobilisation of capabilities and the prompt reply to large-scale nuclear accidents;[12] this situation, one might add, would not have been much different in any other country. In the aftermath of Fukushima the proper implementation of the separation principle in Article 8(2) of the CNS was also subject to debate following which the Japanese government announced its decision to make the Nuclear and Industrial Safety Agency (NISA), Japan's nuclear regulator, more independent by separating it from the Ministry of Economy, Trade and Industry (METI), which promotes the use of nuclear energy.[13]

The current allocation of responsibilities in Japan is a result of the Government Re-organisation Basic Law (No. 103 of 12 June 1998) and other laws related to the administrative reform of the central government and following which the Japanese government was re-organised on 1 January 2001.

The most important governmental, administrative, institutional and technical entities shall be described briefly; however, competencies might change as a result of lessons learnt in the aftermath of the Fukushima accident.

Ministry of Economy, Trade and Industry (METI)

METI[14] is in charge of ensuring a stable and efficient energy supply and the uses of nuclear energy. At the same time, it is the ministry in charge of nuclear safety regulations and the licensing of nuclear installations. Within METI, there are specialised structures which carry out METI's responsibilities in this field.

11. For example Article 8 of the Convention on Nuclear Safety; Article 20 of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management; Article 5 of the Convention on the Physical Protection of Nuclear Material.
12. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter XII, p. 12
13. *Ibid.*
14. Established pursuant to Act No. 99 of 16 July 1999.

Agency for Natural Resources and Energy (ANRE)

ANRE's tasks are to ensure a stable and efficient supply of energy, to promote appropriate uses of energy and to ensure industrial safety. The Department of Electricity and Gas Industry within ANRE is in charge of nuclear energy policy, nuclear energy technology development and radioactive waste management. It also oversees the work of the Japan Atomic Energy Agency (JAEA). ANRE's Nuclear Fuel Cycle Industry Division is responsible for ensuring a stable and efficient supply of nuclear materials, technology development for nuclear fuel materials and nuclear facility siting.

The Nuclear and Industrial Safety Agency (NISA)

NISA is the specialised organisation within ANRE, responsible for regulating both nuclear and industrial safety. The drafting of safety regulations and the licensing of milling and refining, nuclear power reactors, nuclear fuel fabrication, reprocessing and storage of spent nuclear fuel, and disposal of radioactive waste are carried out by NISA.

Ministry of Education, Culture, Sports, Science and Technology (MEXT)

MEXT[15] is responsible for the science and technology aspects of nuclear energy, including policy making, development of nuclear technologies, safety regulations governing research reactors, protection against radiation hazards, the use and transportation of nuclear materials except those originating in nuclear fuel cycle facilities and nuclear power plants, the use, storage and transportation of radioisotopes and safeguards. The ministry is also responsible for nuclear third party liability.

Nuclear regulations are administered by the Science and Technology Policy bureau which is divided into six divisions: policy, research and co-ordination, infrastructure policy, nuclear safety, planning and evaluation, and international science and technology affairs.

The Research and Development Bureau consists of seven divisions, including the research and development policy division, which co-ordinates the work of the Bureau and deals with natural disaster prevention technology and nuclear facility siting. The atomic energy division is responsible for nuclear research policy and programmes including their budget. It is also responsible for nuclear third party liability, international co-operation in the field of nuclear energy, peaceful uses of nuclear energy and the development of nuclear fusion science.

Advisory bodies

Atomic Energy Commission (AEC)

The AEC[16] was established with a view to developing policies on all matters related to the research, development and utilisation of atomic energy. Although its functions are advisory, it is a powerful body which can make recommendations, on its own initiative, to the Prime Minister or to other ministries and agencies involved in regulating the use of nuclear energy. These ministries and agencies are also obliged to consult with the AEC when carrying out their own licensing and

15. Established pursuant to Act No. 96 of 16 July 1999.
16. Established under the Atomic Energy Basic Act. The AEC operates under the terms of the Act on the Establishment of the Atomic Energy Commission, Act No. 188 of 19 December 1955.

regulatory activities. AEC can make recommendations on the following matters: policies on the utilisation of atomic energy; co-ordination between different government agencies involved in regulating nuclear activities; the content of regulations dealing with nuclear fuel and nuclear reactors (apart from safety issues); promotion of nuclear energy research; policies on training of professional and technical staff working in the field of nuclear energy.

Nuclear Safety Commission (NSC)

The NSC's[17] functions are to define regulatory policies for the safe uses of nuclear energy; to issue guidelines for the safety of nuclear fuel, source material and nuclear reactors; to issue guidelines on the prevention of ionising radiation hazards resulting from the use of nuclear energy and radioactive fallout; and to make recommendations on any other aspects of radiation safety as it considers appropriate. The Secretariat of the NSC is in the Prime Minister's Cabinet Office. Licensing authorities are obliged to consult the NSC on safety and radiation protection issues in the course of their licensing procedures. The NSC must confirm subsequent regulation performed by the administrative authorities.

Radiation Council

The Radiation Council[18] is a specialised body placed under the authority of MEXT. The principal function of the council is to establish technical standards for radiation protection and measurement of radioactivity levels. The council has a maximum of 20 members, appointed by MEXT.

Japan Atomic Energy Agency (JAEA)

The Japan Atomic Energy Agency[19] is the major national nuclear research and development organisation. The JAEA operates as an independent public institution with a certain degree of autonomous decision-making powers. It has responsibilities, *inter alia*, in the areas of: basic research on nuclear energy; technical feasibility of nuclear fuel cycle activities; contribution to human development in the nuclear field and to improving expertise amongst nuclear scientists and engineers; and collection, categorisation and dissemination of information concerning nuclear energy.

C. The legal framework

General legislation

The starting point of Japan's nuclear legislation is the Atomic Energy Basic Law[20] (the Basic Law). The Basic Law states that its objectives are to ensure energy resources for the future and to promote the research, development and use of nuclear energy for peaceful purposes. Its provisions deal in very broad terms with the mining of nuclear source materials, control over nuclear fuel materials, control over nuclear reactors, protection from radiation hazards and compensation for damage caused by nuclear activities. These provisions, in effect, only express the

17. The Nuclear Safety Commission was established in 1978 in order to separate the functions for nuclear safety from the Atomic Energy Commission which was also responsible for the promotion of nuclear energy, Act on the Establishment of a Nuclear Safety Commission, No. 188 of 19 December 1955.
18. Governed by the Act on the Technical Standards on Radiation Protection, No. 162 of 21 May 1958.
19. 2004 Act on the Japan Atomic Energy Agency.
20. No. 186 of 19 December 1955.

state's intention to exercise regulatory powers in these areas by means of subsequent legislation. The most important of these subsequent acts are:

- Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors[21] (Reactor Regulation Act);
- Act on the Prevention of Radiation Hazards due to Radioisotopes etc.[22] (Radiation Protection Act); and
- Act on Compensation for Nuclear Damage (Compensation Act).[23]

Radiological protection

The accident at Fukushima has resulted in extremely high on-site radiation dose rates, as well as significantly elevated off-site radiation dose rates in the North of Japan.[24] Exposure to radiation can result in human health risks and at very high exposures, sufficient cells are killed to cause whole tissues to cease functioning. The exposure rates reported in the areas off-site in Japan are over a million times lower than the threshold at which serious effects (illness/death) can occur in exposed members of the public. As opposed to these so-called deterministic effects (also called tissue reactions),[25] there are the so-called stochastic effects[26] where radiation exposure at lower levels may increase an individual's risk of contracting malignant disease and heritable effects without a dose threshold. Scientifically it is not possible to distinguish a cancer/leukaemia caused by radiation exposure from one provoked by other causes. However, it is possible to statistically identify, in large exposed populations, whether or not the measured cancer rate is higher than expected. Hence, regarding such stochastic effects, the exposed population in Japan must have its doses assessed and subsequently, if necessary, medical advice should be provided in the long term.

In Japan, activities involving radioactive substances are governed by the Reactor Regulation Act, the Radiation Protection Act and subsequent ordinances. The aim of the Radiation Protection Act is to regulate the use, sale, lease, disposal or any other handling of radioisotopes and ionising radiation-generating equipment in order to prevent ionising radiation hazards and to ensure public safety. In general, any person who wishes to use radioisotopes or ionising radiation-generating equipment must obtain a licence from the Ministry of Education, Culture, Sports, Science and Technology (MEXT). The ministry will grant the licence if the proposed site, structure and equipment conform to the standards laid down by ordinance of the Prime Minister,[27] and if potential hazards from ionising radiation have been dealt with satisfactorily (Sections 6, 7 and 7-2 of the Radiation Protection Act). MEXT may attach conditions to the licence and may suspend or cancel it if there is non-compliance with the law or any condition thereof. The use of sealed sources containing radioisotopes below a prescribed quantity is exempt from licensing requirements, but advance notification to MEXT is required. The Radiation

21. No. 166 of 10 June 1957, as amended.
22. No. 167 of 10 June 1957, as amended.
23. No. 147 of 17 June 1961, as amended.
24. The following technical information is based on Nakoski, J. and Lazo, T., *op. cit.*
25. "Deterministic effect: Injury in populations of cells, characterised by a threshold dose and an increase in the severity of the reaction as the dose is increased further. Also termed tissue reaction. In some cases, deterministic effects are modifiable by post-irradiation procedures including biological response modifiers", Glossary of ICRP Publication 103.
26. "Stochastic effects of radiation: Malignant disease and heritable effects for which the probability of an effect occurring, but not its severity, is regarded as a function of dose without threshold", Glossary of ICRP Publication 103.
27. Ordinance No. 56 of 30 September 1960.

Protection Act also contains criminal sanctions (fines and imprisonment) for non-compliance with its provisions.

The regulatory requirements concerning worker protection are specified by the Industrial Safety and Health Act. The act provides that employers take measures to prevent damage to the health of radiation workers, including radiation exposure, throughout the period of employment, and it requires that they be educated on issues of health and safety, work environment monitoring and medical examination of workers. On the basis of the law, the Ministry of Health, Welfare and Labour has enacted the Ministerial Ordinance for Prevention of Hazards from Ionising Radiation which prescribes the requirements for controlled areas, dose limits and measurement, protection from external radiation, and prevention of radioactive contamination. Radiation doses of workers are unitarily controlled at the Radiation Worker's Registration Centre.

A worker is any "person who is employed, whether full time, part time or temporarily, by an employer, and who has recognised rights and duties in relation to occupational radiological protection".[28] In 2009, the total number of radiation workers at commercial nuclear installations in Japan was 83 489.[29]

Japanese legislation sets out dose limits for exposure to ionising radiation. The dose limit is 50 millisieverts (mSv) per year for workers; however the limit for exposure to ionising radiation is 100 mSv for a period of 5 consecutive years; i.e. if a worker has been exposed to radiation of 50 mSv for 2 consecutive years, he/she cannot be exposed to ionising radiation for the following 3 years. The exposure limit for members of the public is at 1 mSv per year. This reflects the relevant 1990 recommendations of the International Commission on Radiological Protection (ICRP, the more recent 2007 recommendations have not changed these limits).[30]

In emergency situations, however, the dose limit for normal working conditions is relaxed for workers. The ICRP in its latest 2007 Recommendations (Publication No. 103) recognises three types of exposure situations:

- Planned exposure situations, which are situations involving the planned introduction and operation of sources.
- Emergency exposure situations, which are unexpected situations such as those that may occur during the operation of a planned situation, or from a malicious act, requiring urgent attention.
- Existing exposure situations, which are exposure situations that already exist when a decision on control has to be taken, such as those caused by natural background radiation.

In emergency situations, the legal dose limit is relaxed for the cases of workers who attempt to save lives or who are working to prevent large collective doses from occurring. Under these extreme and emergency situations, workers are allowed to receive up to 500 mSv. Under Japanese legislation, the dose limit in emergency situations is at 100 mSv per year; however, shortly after the accident at Fukushima, the Japanese government raised the radiation dose limit for emergency response workers at the site from 100 mSv to 250 mSv.[31]

28. Glossary of ICRP Publication 103, 2007.
29. Japan's 2010 CNS Report, *op. cit.*, p. 101.
30. ICRP Publication 103.
31. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter VII-1.

As of 23 May 2011, the official status of radiation doses for the workers engaged in emergency work at the Fukushima Daiichi nuclear power station was that approximately 7 800 people entered the site and were exposed to approximately 7.7 mSv on average.[32] There were 30 people recorded as receiving doses over 100 mSv.[33] On 10 June 2011, NISA reported that two workers have received doses in excess of both the 250 mSv emergency exposure limits established by Japan and the internationally recommended 500 mSv emergency exposure limit.[34]

Nuclear safety

Following the accidents at Three Mile Island in 1979 and Chernobyl in 1986 the national and international nuclear communities undertook concerted efforts to enhance the level of nuclear safety of civilian nuclear power plants. Without doubt, the recent accident at Fukushima, once the situation is stabilised, will bring further insights and subsequent improvements. The question is often less on the statutory side but rather on the implementation and enforcement side. Notably, Japan has a sound legal and regulatory framework for the safe uses of nuclear energy for peaceful purposes which will be briefly presented in this section.

For the construction, etc., of a nuclear reactor in Japan, an applicant must comply with the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material and Reactors ("Reactor Regulation Act") and the Electricity Business Act.

The purpose of the Reactor Regulation Act is to ensure the safe and peaceful uses of nuclear source material, nuclear fuel and nuclear reactors. It provides for a comprehensive licensing regime governing nuclear activities (refining nuclear source material, manufacture and use of nuclear fuel, construction, operation and decommissioning of reactors, storage and reprocessing of spent nuclear fuel, disposal of radioactive waste, and any other use of internationally safeguarded material).

The Reactor Regulation Act governs the siting, construction and operation of nuclear facilities. Two Cabinet ordinances establish the details of a comprehensive licensing system: the Ordinance implementing the Reactor Regulation Act (Cabinet Order No. 324, 21 November 1957) and the Ordinance for the definition of nuclear fuel material, nuclear source material, reactors and radiation (Cabinet Order No. 325, 21 November 1957). The Radiation Protection Act is also relevant in relation to the safety aspects of nuclear facilities.

Responsibility for the establishment, operation and decommissioning of a nuclear facility depends on the type of facility involved. METI is responsible for reactors used for electricity generation, including those at the research and development stage, and nuclear fuel fabrication facilities, spent fuel storage facilities, spent fuel reprocessing facilities and waste disposal facilities. MEXT is responsible for granting approval for the construction, operation and decommissioning of research reactors, reactors not used for electricity generation, including those at the research and development stage, and for the use of nuclear fuel material for activities not covered by other licences. The Minister of Land, Infrastructure and Transport is responsible for nuclear powered ships.

32. Report of Japanese Government to IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter VII-5.
33. *Ibid.*
34. The doses received were 678 mSv (external exposure 88 mSv, internal exposure 590 mSv) and 643 mSv (external exposure 103 mSv, internal exposure 540 mSv); see NISA press release of 10 June 2011 at www.nisa.meti.go.jp/english/press/2011/06/en20110613-3.pdf.

The Environmental Impact Assessment Act (No. 81, 9 June 1997) establishes a general procedure for the environmental impact assessment of large scale projects which could have a significant impact on the environment, including the construction of a power plant.

The licensing procedure of reactors is divided into three main stages: approval of a particular site, the granting of a construction licence and, finally, approval to operate the installation. A construction licence for a reactor can only be granted if the minister responsible is satisfied that the reactor will be used only for peaceful purposes, the construction is consistent with the national "framework for nuclear energy policy", the applicant has the necessary technical and financial resources, and the location, structure and equipment of the reactor all comply with safety requirements (Reactor Regulation Act, Section 24). Before granting a licence, the minister in charge must seek the views of both the AEC and the NSC on the proposal (Section 24-2). Once the construction licence has been granted, no change is allowed unless approval has been sought and obtained for the change from the minister (Section 26). Before the reactor can begin operation, an inspection must be carried out to the satisfaction of the minister that the construction conforms to the approved design and methods and to all the relevant technical standards (Section 28). The operator must also have an approved set of safety rules and procedures in place before operations may commence (Section 37).

In light of the discussion on safety reviews of nuclear power plants following the accident at Fukushima,[35] it might also be interesting to note that in Japan, the operator is subject to an annual inspection of the facility by the relevant ministry (Section 29). The Reactor Regulation Act was amended in order to strengthen the nuclear safety requirements within nuclear facilities (Law No. 157, 13 December 1999). In this respect, periodic inspections of processing facilities, compulsory notification of their dismantling, and regular checks of the management and operational procedures of nuclear energy facilities are required to ensure compliance with safety regulations. The law furthermore provides for the appointment of inspectors for safety management of nuclear installations under MEXT and METI in order to carry out such inspections.

A licence may be revoked if the operator fails to comply with the obligations pursuant to the Reactor Regulation Act, any applicable orders made under the Reactor Regulation Act or any licence condition (Section 33).

Several regulations made under the Reactor Regulation Act deal in detail with the various categories of reactor. The regulations concerning the installation, operation, etc., of commercial nuclear power reactors (MITI Ordinance No. 77, 28 December 1978, as amended) cover application procedures for commercial reactor design, construction and alteration of facilities, limits on access to controlled areas, storage of nuclear materials and waste and security measures.

The Reactor Regulation Act also contains penalties for various activities subject to the act (Chapter VIII). It should be noted that Section 6 of the Act on Compensation for Nuclear Damage (No. 147, 17 June 1961) prohibits the operation of a nuclear installation if the financial security for damage required by the law is not in place in respect of that installation.

35. For example, the European Commission announced the reassessment of all 143 nuclear power plants in the European Union following which the regulators of the European Union member states agreed to carry out the so-called "stress tests" from 1 June 2011 onwards.

Emergency management

Immediately after the earthquake of 11 March 2011 and the loss of cooling to unit 1 of the Fukushima Daiichi nuclear power plant, Japanese authorities established emergency response structures (see *infra*). The same evening, the Prime Minister of Japan, as the Head of the Nuclear Emergency Response Headquarters, ordered the evacuation of the population within 3 km and the sheltering ("stay-in-house") of the population within 10 km from the Fukushima Daiichi nuclear power plants as a precautionary measure. The next day, such instruction went out regarding the Fukushima Daiini nuclear power plants while with the exacerbation of the situation at Daiichi, the Prime Minister instructed the evacuation of the population within 20 km radius, advising the population within 20 to 30 km to stay at home.[36] The final evacuation zone remained at 20 km from the Daiichi plants while the evacuation zone from the Daiini zone was relaxed. The evacuation affected approximately 78 000 people and the sheltering affected approximately 62 400 residents.[37]

The major difficulty for emergency management activities was the loss of important infrastructures following the earthquake/tsunami, including the communication channels. Therefore, in regard to the following summary of the legal and organisational emergency preparedness and response structures in Japan, the severe situation and challenges in the specific case of Fukushima should be kept in mind.

The Special Act on Emergency Preparedness for Nuclear Disaster (hereinafter referred to as "Nuclear Emergency Act", No. 156 of 17 December 1999) aims to enforce countermeasures in the event of a nuclear emergency. In this respect it modifies and complements the countermeasures against natural disasters (such as floods, earthquakes, tsunamis, eruptions) governed by the Basic Act on Emergency Preparedness (No. 223 of 15 November 1961) which defines the roles of the national government, local governments, etc., in an emergency.

Under the Nuclear Emergency Act, the licensee must take measures to prevent nuclear emergencies, prepare an emergency action plan in consultation with mayors and prefectural governors, and establish a nuclear disaster prevention organisation. This on-site organisation is responsible for taking necessary measures to prevent or mitigate the consequences of nuclear emergencies. The operator shall also appoint a manager for nuclear emergency preparedness who will be responsible for immediately informing the competent ministers, mayors and governors of municipalities and prefectures of a nuclear emergency. The licensee is also required to install and maintain equipment for measuring radiation doses and to provide special radiation protection clothes, emergency communication equipment, etc.

Local governments conduct on-site inspections to check whether or not preventive measures for a nuclear disaster have been taken by licensees in an appropriate manner. They formulate and implement their respective regional disaster prevention plans. Finally, prefectures support the emergency preparedness carried out by municipalities and ensure the overall co-ordination.

Relevant ministers are to establish off-site centres in each prefecture where a nuclear installation is located, which shall take necessary measures in the event of an emergency situation. Off-site centres have necessary facilities and equipment in order to communicate with the Prime Minister's Official Residence, the Cabinet

36. Regarding the sequence of events and measures taken by the Japanese authorities, see Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter V.
37. *Ibid.*

Office, the Emergency Response Centre of NISA, the Emergency Operation Centre of MEXT and related local governments. Each off-site centre is equipped with means to monitor environmental radiation levels and the plant status.

In order to inform nuclear operators about emergency prevention measures and to collect information in the event of an emergency, MEXT and METI appoint specialists in nuclear emergency preparedness in the vicinity of each nuclear installation.

The Nuclear Emergency Act distinguishes two types of nuclear disasters: the specific event and the nuclear emergency. The specific event includes a case in which a radiation dose detected near the site boundary is 5 mSv or more at one point for more than 10 minutes continuously. The nuclear emergency includes a case in which a radiation dose detected near the site boundary is 500 mSv or more at one point for more than 10 minutes continuously and where emergency response measures are taken, such as sheltering or evacuation of residents or the administration of preventive stable iodine.

The Nuclear Emergency Act provides that, in the event of a nuclear emergency, several structures shall be established:

- Within the Cabinet Office, the Nuclear Emergency Response Headquarters shall be established in Tokyo, headed by the Prime Minister.
- The Technical Advisory Organisation in an Emergency, composed of NSC commissioners and the advisors for emergency response, gives technical advice to the Prime Minister.
- The Nuclear Emergency Response Local Headquarters shall be set up at the concerned off-site centre. Local governments shall establish their own emergency response headquarters.
- A Joint Council for Nuclear Emergency Response is to be established at the off-site centre in order to share information between the national government and related organisations such as local governments, licensees, etc., and, if necessary, to co-ordinate emergency measures by the respective organisations.

At the international level, Japan is party to the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency. Japan participated in several exercises organised at the international level, i.e. the IAEA's Convention Exercise (Convex) and the OECD NEA's International Nuclear Emergency Exercises (INEX). Very regularly national exercises are carried out. Interestingly, on 21 and 22 October 2008, a drill was conducted with the participation of the national government, local governments including the Fukushima Prefecture, TEPCO, and other relevant organisations, assuming an accident at Unit 3 of Fukushima Daiichi nuclear power station in which about 4 000 people, including local residents, participated. In this drill, efforts were made to improve the speed of initial responses, and as part of public relations activities, emergency information was transmitted to the French Embassy in Japan with the co-operation of the embassy.[38]

Third party liability

Soon after the accident, the operator of the Fukushima Daiichi nuclear power plants, Tokyo Electric Power Company (TEPCO), assumed responsibility and liability

38. Japan's 2010 CNS Report, p. 117.

for the nuclear accident. On 28 April 2011, TEPCO established a "dedicated contact line to provide consulting service concerning financial compensation related to the damage caused by the nuclear accident" at Fukushima Daiichi. The homepage of TEPCO provides information to victims (corporations and individuals) on how to claim damages and invites those to submit the so-called "declaration of damage forms".

It remains to be seen how many claims will be filed and how many victims TEPCO will be able to compensate. It will take months and maybe years to fully appreciate the damages which resulted and continue to result from the accident at Fukushima. In the following section, we try to provide answers to questions on the legal framework governing third party liability for nuclear activities in Japan. In particular, the person/entity liable, the extent and nature of that liability, the damages that will be compensable, the availability of funds to cover that liability and the fact that the accident was caused by a grave natural disaster are all both legally and politically important questions.

General principles

Japan has solid national legislation on nuclear third party liability based on the following pieces of legislation and implementing ordinances:[39]

- Civil Code.
- Act on Compensation for Nuclear Damage (Compensation Act).
- Act on Indemnity Agreements for Compensation for Nuclear Damage (Indemnity Act).
- Order for the Execution of the Act on Compensation for Nuclear Damage (Compensation Order).
- Order for the Execution of the Act on Indemnity Agreements for Compensation of Nuclear Damage (Indemnity Order).

According to this legislative framework:

- The operator of a nuclear power plant is strictly liable.[40]
- The operator is exclusively liable.[41]
- The liability is not limited in amount.
- The operator is obliged to financially secure its liability up to a certain amount (for nuclear power plants JPY 120 billion which equals EUR 1.04 billion or USD 1.49 billion as of 20 June 2011).[42]
- Where nuclear damage exceeds the financial security amount, the government may help a nuclear operator to compensate the damage to the extent authorised by the National Diet.[43]
- Japan's Civil Code (Article 724) provides that all rights of action are fully extinguished 20 years following the date of the tort and that actions be

39. Unofficial translations reproduced in *Nuclear Law Bulletin No. 84* (2009/2), p. 159 *et seq.* (except for the Civil Code).
40. Section 3(1) of the Compensation Act.
41. Sections 3(1), 4(1) of the Compensation Act.
42. Sections 6, 7 of the Compensation Act.
43. Section 16 of the Compensation Act.

brought within 3 years from the date at which the person suffering damage had knowledge both of the damage and of the person liable ("discovery rule").

- Claims may be referred to a special Dispute Reconciliation Committee whose function is to mediate disputes concerning compensation claims.[44]

Purpose of the Compensation Act

The Compensation Act provides a special regime of civil tort law for damages of an exceptional nature. At the same time, it includes public law elements, such as state interventions, penal provisions, etc. Section 1 states that the purpose of the act is to "protect persons suffering from nuclear damage and to contribute to the sound development of the industry by establishing the basic system regarding compensation in case of a damage caused by reactor operation". It clearly reflects the view of the early days of the nuclear industry when nuclear third party liability laws were meant to reach two goals: first the protection of the public from the exceptional risks posed by the production of nuclear energy and secondly the protection of the industry and suppliers from ruinous liability claims.[45]

Nuclear damage

According to the definition in Section 2(2) of the Compensation Act, nuclear damage means "any damage caused by the effects of the fission process of nuclear fuel, or of the radiation from nuclear fuel… however, any damage suffered by the nuclear operator who is liable for such damage… is excluded". This provision corresponds to both the Paris and the Vienna Conventions in that it specifically excludes damages to on-site property, unless it is personal property of any person employed on the site.[46] The purpose of this exclusion is to avoid the financial security being used to compensate damage to the installation itself or other property of the operator to the detriment of third parties. The operator of the Fukushima Daiichi nuclear power plants, TEPCO, must therefore assume the loss or damage to its entire property. Contractors whose property is (was) on the site of a nuclear installation at the time of the accident are equally obliged to assume the loss or damage thereto.

The heads of damage are not defined in the Compensation Act. However, the Dispute Reconciliation Committee for Nuclear Damage Compensation, which the Japanese Ministry of Education, Culture, Sports, Science and Technology (MEXT) may establish following an accident, will mediate reconciliation of any dispute arising from the compensation of nuclear damage, will draft instructions to establish the scale of the nuclear damage and will actually assess nuclear damage (Section 18 of the Compensation Act).

Dispute Reconciliation Committee for Nuclear Damage Compensation

In early April 2011, the Japanese government established such a Dispute Reconciliation Committee which will draft (non-legally binding) guidelines for the compensation of nuclear damage. Despite the official mandate of this committee, it is the Japanese courts that will have the final decision on what qualifies as nuclear damage. However, in the past Japan has been successful in out-of-court settlements thanks to the guidelines of committees and the help of local governments. On 30 September 1999, a critical accident happened in a uranium reprocessing facility of

44. Section 18 of the Compensation Act.
45. Schwartz, Julia, "International Nuclear Third Party Liability Law: The Response to Chernobyl", *International Nuclear Law in the Post-Chernobyl Period*, OECD, 2006, p. 37 *et seq*.
46. Article 3(a) of the PC; Article IV(5)(a) of the VC.

JCO Co. Ltd. at Tokai-mura as a result of which approximately 8 000 claims were raised, most of which were compensated according to the guidelines of compensation in out-of-court settlements.

To date, there is no final list of claims that have been brought to the attention of the committee. It will be a challenge to distinguish the damages that were caused by the earthquake/tsunami from those directly linked to radiation exposure risks. Evacuations were ordered, at first, to protect the population from the inundation and one major difficulty for the committee will be to draw a clear line between victims of the natural disaster and those who have suffered nuclear damage in a stricter sense.

The work of the Dispute Reconciliation Committee is ongoing; however first Guidelines on the Scope of Nuclear Damage were adopted on 28 April 2011 which focus on the damage resulting from instructions issued by the central and local governments (e.g. damages following the evacuation instruction; restriction of marine areas; restriction of shipments of agricultural products and marine products). The committee adopted second guidelines on 31 May 2011 which focus on the method of calculating the damages listed in the first guidelines and which establish additional heads of damages. The committee is currently examining the method of calculating other heads of damage, including those suffered by workers, bankruptcies, costs of decontamination measures, etc.

Exoneration

The operator of a nuclear power plant is strictly and exclusively liable for damage which is caused as a result of the operation of the reactor. However, in light of the massive earthquake and the ensuing tsunami the question of exoneration becomes pertinent and indeed Section 3 of the Compensation Act provides:

> "Where nuclear damage is caused as a result of reactor operation, etc., during such operation, the nuclear operator who is engaged in the reactor operation, etc., on this occasion shall be liable for the damage, *except in the case where the damage is caused by a grave natural disaster of an exceptional character or by an insurrection*".[47]

Given the experience of Japan with natural disasters, the exoneration clause can be seen as a policy decision which relieves the operator and transfers this extraordinary risk and burden to the state collectively. The case, in a way, rationalises the main purpose of the act which is, as mentioned above, "to protect persons suffering from nuclear damage" and "to contribute to the sound development of the nuclear industry". Section 17 of the same act thus states:

> "Where the provision for exoneration in Section 3, paragraph 1 applies… the government shall take the necessary measures to relieve victims and to prevent the damage from spreading."

The above quoted text is an unofficial translation by the OECD's translation service. It has been confirmed, however, that the actual Japanese term corresponds

47. Emphasis added. Note that the 2004 Protocol to amend the Paris Convention does not allow for the exoneration of the operator for nuclear damage caused by a nuclear incident directly due to natural disasters, see Article 9 of the 2004 Protocol (the only grounds for exoneration will be "an act of armed conflict, hostilities, civil war, or insurrection"). Same applies to the 1997 Vienna Protocol [see Article IV(3)]. The Convention on Supplementary Compensation for Nuclear Damage does provide that the "operator shall not be liable for nuclear damage caused by a nuclear incident caused directly due to a grave natural disaster of an exceptional character"; however, the law of the installation state may provide to the contrary, see Annex, Article 3(5)(b), to the CSC.

to the English terms "to relieve" or "to aid" victims which seems to have been chosen purposefully to impose a different obligation on the government compared to the "compensation" obligation imposed upon facility operators.

The government's statements following Fukushima do not suggest that TEPCO will be exonerated from liability due to the "exceptional" character of this natural disaster. TEPCO's statements do equally not suggest that it will invoke the application of this provision in its favour. When the Compensation Act was enacted, the conditions for the exemption on natural disasters were described in the Congress as "huge natural disaster beyond all expectations of humankind".[48] Japan as an earthquake prone archipelago has a rather unique perception of what qualifies as a "grave natural disaster of an exceptional nature". For example, the earthquake in Kobe on 17 January 1995, which registered at 6.9 on the Richter scale and resulted in over 5 000 deaths, did not qualify as a grave natural disaster of an exceptional character.

Courts in civil proceedings will decide if the earthquake of 11 March 2011 qualifies as such a natural disaster beyond all expectations of humankind, but only if TEPCO decides to invoke this exemption against claimants.

Liability and financial security

This section presents the situation in which the exoneration in Sections 3 and 17 do not apply.

Where the operator is liable according to Sections 3 and 4, its only recourse against a third party is where the damage is caused by the wilful act of that third party or where the operator has entered into a special agreement with that third party (such as a supplier) regarding rights of recourse (Section 5).

In the absence of such recourse, the operator's liability is unlimited in amount and its financial security will come into play as a "contract of liability insurance for nuclear damage and an indemnity agreement for compensation of nuclear damage or as a deposit, approved by… MEXT as an arrangement that makes available for compensation of nuclear damage, 120 billion yen… for each installation or site… or as an equivalent arrangement approved by MEXT" (Section 7 of the Compensation Act).

The six units at Fukushima Daiichi are treated as one site, the same applies to the four units at Fukushima Daiini as a result of which for each site the financial security amount is at JPY 120 billion.

A contract for liability insurance is, worldwide, the most common means of financial security. It is interesting that as an alternative to insurance Japanese operators may fulfil their obligation to financially secure their liability by a deposit, Sections 12 *et seq*. of the Compensation Act. The deposit may be made either in cash or in security as provided by MEXT to the legal affairs bureau or the district legal affairs bureau nearest to the main office of the nuclear operator. In case of an accident victims would receive compensation from the cash or the deposited securities.

Should damages exceed the maximum amount of financial security of JPY 120 billion, the operator remains liable (unlimited liability). However, in that event, Section 16 provides that "the government shall give a nuclear operator… such aid as is required for him to compensate the (excess) damage… when the government deems it necessary in order to attain the objectives of this act". Such aid

48. Presentation by Japan to the OECD NEA's Nuclear Law Committee meeting on 15/16 June 2011.

shall be given to the extent that the government is authorised to do so by the National Diet [Section 16(2) of the Compensation Act].

Regarding the Fukushima case, the Japanese government considered the need for such aid and on 13 May 2011 released the "framework for governmental support to Tokyo Electric Power Company (TEPCO) to compensate damage caused by the accident at Fukushima nuclear power station" in which it recognises its "social responsibility… and will provide support to TEPCO under the framework of the Compensation Act, basically aiming to minimise the burden to be placed on the public".[49]

Indemnity agreements

In specifically enumerated cases,[50] so-called "indemnity agreements" for the compensation of nuclear damage constitute an alternative means by which an operator can protect itself against risks for which no coverage is available under standard insurance contracts. These agreements fall under the scope of application of the second statute, the Act on Indemnity Agreements for Compensation for Nuclear Damage. This act provides that where an operator is unable to obtain insurance or other financial security to cover its obligations, the government may indemnify that operator in respect of compensation which it (the operator) has been obliged to pay.[51] Operators in Japan are often unable to obtain insurance or other form of financial security in respect of certain risks, such as earthquakes, volcanic eruptions, and tidal waves. Japanese law distinguishes thus between natural disasters of an exceptional character (with resulting operator exoneration) and those which are below that threshold (and for which operators are obliged to financially secure their liability by indemnity agreements).

The Indemnity Agreements Act stipulates in Section 2 that indemnity agreements will be concluded between the government and the operator "under which the government undertakes to indemnify the nuclear operator for his loss arising from compensating nuclear damage not covered by a liability insurance contract or other means for compensating nuclear damage in case the nuclear operator becomes liable, and under which the nuclear operator undertakes to pay an indemnity fee to the government". Nuclear damage caused by an earthquake or volcanic eruption [Section 3(1)] is subject of such an indemnity agreement. The Order for the Execution of the Indemnity Agreement Act extends its scope of application to "tidal waves" [Section 2 of the order in connection with Section 3(5) of the act]. It does thus not matter whether the damage was caused by the earthquake or strictly speaking by the tsunami since both natural phenomena are risks in respect of which indemnity agreements between the operator and the government apply.

The government's obligation to indemnify the nuclear operator is equivalent to the amount of financial security required by Section 7(1) of the Compensation Act, JPY 120 billion for each installation. Another aspect of the subsidiary nature of indemnity agreements is that wherever the operator has concluded a means of financial security, other than liability insurance contracts, to compensate damages, the amount under the indemnity agreement shall be reduced by the amount available under such other arrangements [Section 7(1) text within brackets]. Also, the time period of the agreements is linked to the reactor operation since according to Section 5 of the act, the period of the indemnity agreement shall run from the time of its conclusion to the time when reactor operation has ceased.

49. www.meti.go.jp/english/earthquake/nuclear/pdf/20110513_nuclear_damages.pdf.
50. See Section 3 of the Indemnity Agreements Act.
51. See Section 10 of the Compensation Act and Section 2 of the Indemnity Agreements Act.

In actual practice, it is the operator which will compensate the victim and, then, in turn, be indemnified therefor by the government. Note that the right to indemnification is extinguished three years after the nuclear operator has paid compensation (see Section 11 of the Indemnity Agreements Act).

Finally, the calculation of fees depends on a formula specified in the act, but depends also on very individual circumstances: the operator pays an annual fee "taking into account the probability of the occurrence of damage covered by the indemnity agreement and the expenditures of the government in relation to the agreement and other conditions concerned".[52] Section 6 of the act in connection with Section 3 of the corresponding order stipulates that the rate shall be 0.03% of the indemnity agreement amount. In order to cover the risk of JPY 120 billion, the annual fee would amount to JPY 36 million; however, the calculation does not take into account individual circumstances, especially the fact that for the maximum amount of coverage the fees should be declining.

Transboundary nuclear damages

Japan is not a contracting party to any of the international nuclear liability conventions. Should there be claims brought forward from outside Japan, claimants will have to rely on general tort law with the burden to establish fault, etc.

Japanese courts would have jurisdiction regarding claims for damages, but applicable law for such claims would not necessarily be that of Japan. Article 17 of the Japanese Act on General Rule for Application of Laws[53] provides that "claims arising from a tort shall be governed by the law of the place where the results of the infringing act are produced. However, if it was not foreseeable under normal circumstances that the results would be produced at that place, the law of the place where the infringing act occurred shall apply". Therefore, Japanese law would apply only if the damage claimed is judged as not foreseeable.[54]

If such foreign damage is claimed in a foreign court, the claimant has to obtain an execution judgment ("judgment on judgment") in Japanese courts for the enforcement in Japan (Article 22 and Article 24 of the Civil Execution Act[55]). In the trial for an execution judgment, the court would not examine whether the foreign judicial decision is justified or not, but the claimant would have to prove that the foreign judgment is final and binding and that all requirements provided by Article 118 of the Code of Civil Procedure, are met.[56]

D. Conclusions

This paper summarised the current institutional and legislative framework in Japan, aware of the fact that following the severe accident at Fukushima Daiichi, it is essential to carefully re-examine the system and adopt the necessary reforms.

Japan will need time to tackle the challenges ahead and moving in that direction it has made frank statements in terms of weaknesses which it will have to remedy. For example, the Japanese government has announced that it will separate the regulatory body, the Nuclear and Industrial Safety Agency, from the Ministry of Economy, Trade and Industry which is also in charge of ensuring a stable and

52. Section 6 of the Indemnity Agreements Act.
53. Act No. 78 of 2006.
54. Presentation by Japan to the OECD NEA's Nuclear Law Committee meeting on 15/16 June 2011.
55. Act No. 4 of 1979.
56. Presentation by Japan to the OECD NEA's Nuclear Law Committee meeting on 15/16 June 2011.

efficient energy supply.[57] This is an unfortunate case, where five review meetings of the Convention on Nuclear Safety that were supposed to put peer pressure on contracting parties regarding the implementation of the convention failed, and it took a severe accident for a country to realise that only a strong regulator which is *de jure* and *de facto* independent from promotional interests is a credible guardian of nuclear safety.

It is certain that Japan will emerge stronger after the earthquake, including its nuclear sector. To this end, it has announced an enhanced post-Fukushima framework for nuclear safety. In this process, it is hoped that Japan will continue and enhance its participation in the international nuclear community so as to help strengthen nuclear safety worldwide.

57. Report of Japanese Government to the IAEA Ministerial Conference on Nuclear Safety, *op. cit.*, Chapter XII-12.

Legal and regulatory aspects of long-term operation of nuclear power plants in OECD member countries

*by Sam Emmerechts, Christian Raetzke and Benjamin Okra**

Nuclear power plants are typically designed to operate for 30 to 40 years. Between 2010 and 2020 a large number of nuclear power plants in the world and in OECD member countries, in particular, will reach their 30th or 40th anniversary.[1] As of June 2011, out of 440 nuclear power plants operating in the world, approximately 81% had been in operation for more than 20 years and about 35% for more than 30 years.[2] In OECD member countries there are at present 339 nuclear reactors in operation, of which 135 reactors (39.8% of the total number) are over 30 years old and 15 reactors (4.4% of the total number) are over 40 years old. All nuclear reactors in Finland have reached their 30th anniversary while in the United States 56% of all reactors are beyond 30. In the United Kingdom and Germany about 42% of nuclear reactors are older than 30 years while in Canada, France and Japan, the respective percentages in this age bracket amount to 22%, 34% and 30%.

In most countries with nuclear reactors older than 30 or 40 years, it was decided to continue operating individual plants beyond this initial time frame for which they were licensed or designed (hereinafter referred to as "long-term operation" or "continued operation"). In other countries, where nuclear reactors are approaching the 30/40-year threshold, discussions have started to do the same. Countries in general allow nuclear reactors to continue operating beyond the period that was initially envisaged, permitting a total lifetime of 50 to 60 years, as long as they can be operated safely. The 30th or 40th anniversary is not an "expiry date" from a technical point of view. The design lifetime means that, at the time of licensing, it was demonstrated that the major components would be able to function safely for 30 or 40 years. However, as has become apparent, many key components of a nuclear reactor, such as the reactor pressure vessel and the pipes, continue to be fully functional beyond the originally foreseen time span for two reasons: first, improved operating methods, instrumentation and control have helped to decrease the number of so-called "transients", such as a reactor scram, which put stress on

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1. The Organisation for Economic Co-operation and Development (OECD) is an intergovernmental organisation of 34 countries founded in 1961 to stimulate economic progress and world trade. Member countries include Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Republic of Korea, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. Nuclear capacity in OECD member countries represents 85% of world nuclear capacity (source: *Nuclear Energy Data 2010/Données sur l'énergie nucléaire 2010*, OECD, 2010).
2. IAEA, Power Reactor Information System, www.iaea.org/programmes/a2/.

components. Secondly, improved core load patterns have helped to reduce the "embrittlement" exposure of the reactor pressure vessel to levels that are much lower than those initially expected.

A different question is whether the design of the nuclear power plant, even if all components are in perfect condition, is still judged to be in line with current safety requirements. Those safety requirements tend to rise over the decades due to progress in science and technology, feedback from operating experience and lessons learnt after major nuclear accidents, such as Three Mile Island, Chernobyl or, most recently, Fukushima.

Within this framework, economic reasons will usually drive long-term operation of nuclear reactors. Operators will seek permission to continue operating a nuclear power plant beyond 30 or 40 years if this is economically viable given the investments necessary to continue to comply with the nuclear safety framework as required by regulators. On the one hand, substantial backfitting may be required due to regulatory requirements. On the other hand, the capital costs to allow long-term operation of nuclear power plants may be much smaller than investment in any type of replacement capacity. In many OECD member countries utilities tend to choose continued operation of existing nuclear reactors as the cheaper and less risky alternative to new build. Indeed, there are many hurdles which new builds have to overcome, for example, unstable financial markets, complicated and unpredictable licensing procedures, public opposition to nuclear, lost experience from earlier construction and general shortage of skills.

Governments may equally prefer long-term operation of nuclear reactors because it allows their countries to continue benefiting from a diversified energy mix and to enhance security of supply. Environmental considerations may constitute additional justification for favouring continued operation of nuclear reactors. Indeed nuclear plants are carbon free, as opposed to gas and coal installations, allowing governments to meet their greenhouse gas emission reduction targets. However, governments and regulators will only agree to long-term operation as long as all systems, structures and components of the installation continue to function as determined by the licence. It is therefore essential to understand the role of the licence when analysing the operation of nuclear reactors beyond the time frame originally anticipated for operation.

This article will not deal with "lifetime extension" in a technical sense. Lifetime extension is a technical concept based on reactor design considerations to address ageing problems that can be cured by technical operations and replacing components. The article will rather focus on the broader legal and regulatory questions, namely the administrative procedures and conditions for the extension of an operating licence or for other administrative procedures so that a nuclear reactor can operate beyond the originally anticipated time frame. The notions "long-term operation" or "continued operation" will be employed to address this regulatory concept. "Long-term operation" is defined by the International Atomic Energy Agency ("IAEA") as follows:

> "Long-term operation is operation beyond an established time frame set forth by, for example, licence term, design, standards, licence and/or regulations, which has been justified by safety assessment with consideration given to life limiting processes and features of systems, structures and components".[3]

This article is divided into five parts. The introduction has already provided the reasons which drive requests for and authorisations of long-term operation of nuclear reactors. Section A will address the authorisation process for long-term

3. *Safe Long-term operation of Nuclear Power Plants*, IAEA Safety Reports Series No. 57, 2008.

operation, explain the different approaches regarding licence validity and focus on periodic safety reviews. Section B will analyse the possibility to appeal a decision on long-term operation and any grounds for financial compensation. It will examine whether the safety standards at the time of the original licence or the present safety standards are applicable when continued operation is approved. The question is challenging from a legal point of view because there must be a legal basis for new safety standards to be imposed on the operator who seeks continued operation. Section C will analyse the impact of the accident at Fukushima on long-term operation and finally, the article will end with some concluding remarks on the legal and regulatory aspects of continued operation of nuclear reactors in OECD member countries. An annex to the article provides a short analysis of the legal and regulatory framework for long-term operation of nuclear reactors in selected OECD member countries, i.e. Canada, Finland, France, Germany, Japan, the United Kingdom and the United States.

A. Legal and regulatory criteria for long-term operation

Procedure

Long-term operation of nuclear power plants requires approval by the competent authority. Such approval may be obtained at the end of a process of consultation between the utility/operator ("the licensee") and the competent authority. The process is initiated by the operator who requests permission for long-term operation of his/her plant. Both the application and the project description are sent to the authority in charge of operating licences.

The process to extend the lifetime of nuclear power plants is subject to a safety review. Under the safety review, the regulatory authority must be reasonably assured that the plant will continue to be operated in accordance with the plant specific licensing basis. The regulator verifies whether the applicant has demonstrated that the legal and regulatory requirements can be met during the period of continued operation. This entails that, on the one hand, an "ageing management" is in place to ensure that all systems, structures and components continue to fulfil their functions as defined by the licence. On the other hand, the question arises whether the design of the nuclear reactor as such may be compared to modern standards as a consequence of which upgrading and backfitting would be necessary (see Section B).

In addition to the safety review, an environmental impact assessment is often mandatory if the long-term operation is linked to a licence renewal (as for example in Finland, Spain and the United States).[4] The purpose of the environmental review is to determine if the impact of long-term operation on the environment is significant enough to preclude licence renewal.[5]

4. For more information on environmental protection and nuclear law, see Emmerechts, S. "Environmental Protection under Nuclear Law: Still a Long Way to Go", *International Nuclear Law, History, Evolution and Outlook, 10th Anniversary Publication of the International School of Nuclear Law*, OECD, 2010, pp. 121 *et seq*.
5. The prevailing interpretation is that the renewal or extension of the licence is treated as a project modification. For example, in Finland the Act on Environmental Assessment Procedure not only imposes an environmental impact assessment (EIA) for the development of certain projects, but also for changes/modifications of projects. In case of nuclear power plants, an EIA is carried out when the decision in principle is granted by the government, but is not required for the two later phases, the construction licence and the operating licence phase. However, the Act on Environmental Assessment Procedure provides that an EIA must be carried out not only for projects but also for changes of

The decision-making process on continued operation of a nuclear reactor will usually take at least three years.[6] The extension period requested (2, 5, 10 or 20 years), the operating history of the plant, the ageing and in-service inspection histories of important safety-related components and the degree of certainty about the long-term performance of safety components are all important considerations for the competent authority when deciding whether or not to authorise long-term operation.

Licence: fixed term or indefinite term

The national regulatory framework determines the timing for the submission of an application for long-term operation. There are basically two different approaches to the licensing of continued operation of nuclear power plants: some OECD member countries issue operating licences that have a fixed period of validity ("fixed licence term"), while others grant licences that have indefinite validity ("indefinite licence term").

In countries with a fixed licence term the authorisation to operate a nuclear reactor is issued for a limited period of time, at the end of which the operator must formally apply for a "licence renewal". Examples of countries with a fixed licence term for some or all of their plants are Finland, Mexico, Spain and the United States.

In countries with an indefinite licence term the validity of the operating licences is not limited in time, however the continued safe operation of the plant and compliance with regulatory requirements are subject to periodic review. The operator need not formally apply for a licence renewal since the licence remains valid. The nuclear power plant can operate as long as the contrary is decided by the operator or the competent authority. Belgium, France, Germany, Japan, the Netherlands[7] and the United Kingdom are all countries with an indefinite licence term.

In countries with a fixed licence term the expiration date of the term plays an important role for the long-term operation of nuclear reactors. At that moment the licensee and the regulatory authority will need to review the plant's operating experience to date and decide what replacements, upgrades or ageing management programmes are necessary. The licence will only be renewed if the operator is able to ensure that he/she can operate the plant safely during the renewal period.

In countries with an indefinite licence term the licence does not "expire" at a fixed point in time. The review of the plant's operating experience and safety evaluations in such countries occur at regular intervals, for example every ten years, during the so-called periodic safety reviews ("PSR"). Only when the PSR is conducted successfully will the licensee be authorised to continue operation. PSRs may also take place in countries with fixed licence terms. In Finland for instance, PSRs are typically carried out in connection with the licence renewal, but when longer operating licences have been granted they have been conditioned by a periodic

existing projects that are likely to cause environmental impacts comparable to new projects that must go through an EIA. Thus, if the new licence clearly implies more considerable environmental impacts, then the extension of an operating licence is also subject to an EIA. In practice this has been considered to be the case if an uprate of thermal power takes place – but each case is assessed separately.

6. In the United States, the NRC's goal is to complete licence renewal reviews within less than two years (22 months) of receipt of the application. However, if there is a request for an adjudicatory hearing, the NRC's goal is to complete its review within 30 months of receipt of the application.
7. Although Germany and Belgium have licences without a fixed term, one could argue that both countries indirectly introduced a quasi fixed term by issuing phase-out legislation.

safety review.[8] In substance, it implies that the regular programme of inspections is supplemented with a PSR as a measure of self-assessment for the licensee in terms of its safety culture and its organisational structure.

"Fixed" and "indefinite" licence terms are largely legal and administrative concepts rather than safety ones. The compliance of plants with the licence conditions, applicable legislation, regulatory requirements and safety standards will continuously be supervised by the regulatory authority, regardless of their location in a country with a fixed licence term or in a country with an indefinite licence term.

Permission for long-term operation: safety tests and periodic safety reviews

Article 14 of the Convention on Nuclear Safety is undoubtedly the most important clause in international nuclear law in the field of long-term operation. It stipulates that:

"Each Contracting Party shall take the appropriate steps to ensure that:

i) comprehensive and systematic safety assessments are carried out […] throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions."

The principles of Article 14 of the Convention on Nuclear Safety with regard to safety assessment of operating installations are valid throughout the entire operating life, starting from commissioning. However, they gain particular importance during the decision-making process on the extension of operation lifetimes.

As has already been mentioned, normally the PSR is the safety review relevant for the decision on long-term operation. The PSR is a safety analysis conducted by the operator that is geared towards safe operation of the plant in the future. It assesses the cumulative effects of plant ageing and plant modifications, operating experience, technical developments and siting aspects. A PSR aims at demonstrating to the regulator that an existing plant is as safe as originally designed and that it will still be safe for the next ten years, at comparing it against the most recent international safety standards, and at determining which improvements are reasonably practicable to resolve the safety issues that have been identified. The first PSR is performed after ten years of operation. Since this article is about long-term operation, it will focus on the PSR after 30 or 40 years of operation which is likely to be more comprehensive and more rigorous than the first one.

PSRs allow for an overall review of actual plant safety in order to determine reasonable and practical modifications that should be made to maintain a high level of safety and to improve the safety of older nuclear power plants to a level close to that of modern plants.[9] Hence PSRs are considered an effective tool and a key

8. If the operating licence is granted for more than ten years (as is the case with both existing Finnish nuclear power plants), YVL 1.1 requires that the licensee carry out a periodic safety review of the facility and request its approval from the regulatory authority STUK within ten years of receiving the operating licence or of conducting the previous periodic safety review.
9. See IAEA Safety Standards Series – IAEA Safety Guide NS-G-2.10, 2003.

regulatory instrument to judge the appropriateness of long-term operation of nuclear power plants. PSRs provide reassurance that there continues to be a valid licensing basis, that with plant ageing, modifications are made to the plant and that current international safety standards are taken into consideration.

In most OECD member countries the legal requirement for a comprehensive safety review as a prerequisite for continued operation is found within the operating licence of the plant, either in the licence itself or in one of the conditions attached. In Belgium, Mexico, the Netherlands and Spain it is contained in the operating licence while in the United Kingdom it is included in a condition attached to the licence. Occasionally it is set out in legislation, e.g. in Germany,[10] France[11] and the Republic of Korea.[12] In other cases, however, it is simply requested or imposed by the regulator as part of its normal regulation of the plant, although it may be based on a specific regulation, e.g. in Japan[13] and Sweden.[14]

Besides the PSR, there may be special safety reviews that focus on particular design elements and that are based on lessons learnt from particular events and findings. For example, the reactor accidents at Three Mile Island (1979) and Chernobyl (1986) led to reviews of design safety and to the adoption of design enhancements. In this regard the recent accident at Fukushima (2011) has and will continue to have the same effect. For example, the European Commission has announced and agreed upon together with the senior level regulators of member states (European Nuclear Safety Regulators Group – ENSREG) to carry out the so-called "stress tests" in all 143 nuclear power plants in the European Union.[15] The tests are designed to be "a targeted reassessment of the safety margins of nuclear power plants in the light of the events which occurred at Fukushima: extreme natural events challenging the plant safety functions and leading to a severe accident".[16]

Typically, accidents of such a serious nature first trigger a short-term special review such as the mentioned "stress test". In the mid to long term, lessons learnt from these accidents are incorporated into regulations and thus become an intrinsic part of the PSR, including the one aimed at justifying long-term operation.

Possibility to appeal a decision on long-term operation

Unless legislation is in force that prevents long-term operation such as nuclear phase-out laws,[17] the competent national authority will generally grant an

10. Section 19a "Safety Review" of the German Atomic Energy Act, as amended in 2002 (reproduced in the Supplement to *Nuclear Law Bulletin No. 70*).
11. See Article 29, paragraph 3 of the 2006 Nuclear Transparency and Safety Act. The decree authorising the establishment of a specific nuclear facility may impose a different periodicity.
12. In the Republic of Korea, the Atomic Energy Act requires a comprehensive PSR every 10 years.
13. In Japan, the requirement that a PSR takes place every ten years appears in the "Rules for Establishment and Operation of Commercial Nuclear Power Reactors", which were enacted in January 2006 as part of an effort to improve the safety and reliability of the nuclear power plants.
14. SSM Regulation in Sweden (SSMFS 2008:17, formerly SKIFS 2004:2).
15. Press Release Rapid IP/11/640 of 25 May 2011.
16. http://ec.europa.eu/energy/nuclear/safety/doc/20110525_eu_stress_tests_specifications.pdf.
17. By way of illustration one could think of Sweden. Despite the existence of indefinite term licences, the legislator decided to adopt legislation allowing any time the shutdown of an existing nuclear reactor against compensation ("phase-out legislation") thereby leading to the shutdown of the Barsebäck plant. Phase-out legislation globally limiting the lifetime of all nuclear installations has been adopted in Belgium as well as in Germany (see also the country report on Germany in annex). In Germany, the Obrigheim nuclear reactor was

authorisation for long-term operation provided that the licensee demonstrates that the plant complies with the relevant safety standards, if necessary by performing upgrading and backfitting. Obviously non-compliance with such standards will be a fundamental reason to refuse continued operation. This principle applies in a similar fashion during the lifetime of the nuclear power plant and is not specific to long-term operation.

In all OECD member countries the nuclear regulator is the competent body to verify compliance with licence conditions in relation to long-term operation of nuclear reactors. However, the body that has legal authority to decide on whether or not to grant continued operation of the plant differs from country to country.

In those countries where the operating licence has a fixed term and needs to be renewed, the competent authority is the one which has granted the original licence: it may be the government (as is the case in Finland) or it may be the regulatory authority itself as in Canada where the Canadian Nuclear Safety Commission (CNSC) makes such decisions or in the United States where the Director of the Nuclear Regulatory Commission's (NRC) Office of Nuclear Reactor Regulation, under the authority delegated to him by the Commission, issues the renewed licence.

In most OECD member countries, the decision concerning the extension of the validity of an operating licence is a regular administrative decision to which the traditional appeal procedures apply. An appeal may be submitted by the licensee itself to contest a refusal of long-term operation.[18] However, in reality long-term operation is rarely refused by the authorities. Decisions to shut down older plants are traditionally taken by licensees themselves rather than being imposed by regulatory authorities. In most OECD member countries an appeal to contest an authorisation of long-term operation may also be filed by an affected third party, such as an individual living in the neighbourhood of the nuclear reactor or, depending on national legislation, an environmental non-governmental organisation.

The appeal is handled in court, the competent court being in the majority of cases an administrative tribunal such as the Supreme Administrative Court in Finland or the *Conseil d'État* in France.[19] However, since traditional courts may not be the most appropriate fora to handle nuclear operating licences because of the technical complexity of the matter, some countries also foresee an out-of-court review procedure for decisions on long-term operation of nuclear power plants, prior to a regular court procedure.

In Canada and the United States the regulator is competent to hear such reviews. Institutional measures are taken to avoid accusations of bias since the regulator acts as both judge and party when hearing appeals, for example in the United States. Appeals in the United States are governed by the NRC's Rules of Practice in 10 CFR

forced to shut down in 2005 due to this legislation. In Belgium, the first reactors will be affected in 2015, unless legislation is changed by then.

18. This should not come as a surprise since the licensee will only apply for an authorisation of long-term operation after having made sure that it is economically viable to comply with the regulator's safety requirements for long-term operation. One example where long-term operation was indeed refused by authorities is the José Cabrera nuclear reactor in Spain. Despite a request for continued operation for another ten years, the operating licence of José Cabrera was only extended for five years in 2001. The reactor was shut down in 2006.
19. In France, there is a possibility to appeal the decision before the *Conseil d'État* and to challenge the legality of the decree adopted by the government. The *Conseil d'État* acts as an appellate body albeit that its composition is different from the one when advising to grant or deny an operating licence.

Part 2 (Part 2.321 in particular). A board composed of three administrative judges from the independent administrative tribunal of the NRC[20] presides over licensing procedures. All decisions taken by Atomic Safety and Licensing Boards may be appealed to the NRC pursuant to 2.341(b).[21] The commission has full discretion whether or not to undertake appellate review of its licensing boards' merits decisions.[22] In turn, commission decisions may be appealed to an US Court of Appeal.

In Canada the nuclear regulator is considered to be an administrative tribunal that is competent to hear appeals regarding renewals of operating licences. Such appeals may be made to the Canadian Nuclear Safety Commission (CNSC) by any person who is directly affected by the renewal, suspension, amendment, revocation or replacement of a licence. A constitutional principle holds that the superior courts are competent to control the operation of any administrative tribunal, including the CNSC, in order to ensure that decisions by the latter are taken within the jurisdiction conferred upon it by the Parliament or the Legislature, and that parties are treated fairly. The Superior Court thus holds the power to annul a decision by the nuclear regulator, to seek its review and to reform it.

In the United Kingdom an out-of-court appeal mechanism is provided through the Health and Safety Inspectorate (HSE).[23] Despite the absence of detail in the guidance on the appeal procedure, it would probably be used for example if there has been a procedural irregularity in the decision-making process which both the licensee and regulator wish to put right without resorting to the courts. As an informal route of appeal, there are clear limitations to this mechanism which may not help resolve substantive points.

In some countries out-of-court procedures must be exhausted before access to courts is authorised regarding nuclear operating licence matters. For example, if a licensee in Japan wishes to challenge a decision taken by the Ministry of Economy, Trade and Industry following an assessment performed by the Nuclear and Industrial Safety Agency, including decisions to refuse long-term operation, the licensee may not directly file an appeal before a tribunal.[24] He/she must first lodge an administrative request with the Ministry of Economy, Trade and Industry within strict time limits and wait for the reply.[25]

20. Established under Section 191 of the Atomic Energy Act, 42 USC 2241.
21. The right to appeal or petition for review is confined to participants ("interested parties") in the proceeding before the Licensing Board. Thus, with the single exception of a state which is participating under the "interested state" provisions of 10 CFR § 2.315(c), a non-party to a proceeding may not petition for review or appeal from a Licensing Board's decision.
22. NRC rules say that the commission may grant review of initial board decisions based on "any consideration" it "deems to be in the public interest". Private Fuel Storage, L.L.C. (Independent Spent Fuel Storage Installation), CLI-04-10, 61 NRC 131, 132 (2004) [quoting 10 CFR § 2.341(b)]; Entergy Nuclear Operations, Inc. (Indian Point, Units 2 and 3), CLI-08-7, 67 NRC 187 (2008).
23. In the United Kingdom, the pertinent legislation does not provide for a right of appeal against a decision made by the Nuclear Directorate of the Health and Safety Executive under Section 44 of the 1974 Health and Safety at Work Act. It is in fact rather unusual and it is an element that may change in the event that nuclear legislation in the United Kingdom is updated.
24. See Article 70 of the Law for the Regulations of Nuclear Source Material, Nuclear Fuel Material and Reactors.
25. By way of example, the Nagoya High Court proceeded to the removal of an operating licence for the Monju reactor in January 2003. The Monju reactor was shut down in December 1995 following a sodium leak accident and fire. In 2000, Japan Atomic Energy Agency announced their intention to restart the reactor but a series of appeals were

In Germany, any decision of the regulatory authority can be appealed before the competent court, both by the licensee and by third parties who can show a legal interest, as for example individuals living close to a plant. However, since 2002 reactor lifetimes have been fixed by the legislator in the Atomic Energy Act. Hence, a decision by a regulatory authority ordering final shutdown of an individual plant prior to the date provided by the Atomic Energy Act is theoretically possible but highly unlikely to occur.

Financial compensation for refusal of long-term operation

Article 9 of the Convention on Nuclear Safety provides that the prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence. If the operator is no longer in a position to provide acceptable assurances of continued safe operation of the installation, the regulatory authority will refuse or revoke the authorisation to operate the plant due to these safety reasons. It is obvious that the operator will not be entitled to any financial compensation for losses as a result of this regulatory decision.

However, in some situations renewing the operating licence of a particular nuclear installation may be refused, explicitly or implicitly, for reasons other than safety. This situation is equivalent to governments or national parliaments limiting the operational life of nuclear installations in time, for example because of a change of the national energy policy. If, in the context of long-term operation, it is decided to refuse or revoke the authorisation to operate for reasons other than safety, would the operator of the affected nuclear facility be entitled to any financial compensation? In other words, is the right to operate a particular installation considered to be constitutive of the property rights attached to the operator's ownership thereof or, on the contrary, considering that an operating licence is granted, suspended and revoked at the discretion of the administration, would the adoption of legislation limiting the operational life of an installation be considered a regulatory measure which would not infringe the property rights attached to the operating licence? The answer to this question seems to depend upon the national legal culture and varies among OECD member countries.[26]

In some countries the operator would probably not be entitled to any financial compensation. For example, in Canada a licence granted by the CNSC does not grant proprietary rights to the holder. In 2008, the Supreme Court of Canada rendered an important decision which clarified the criteria or conditions for a licence to become

formed against this very decision and the award of the initial operating licence, resulting in a series of court battles. In 2003, the Nagoya High Court made a ruling reversing its earlier 1983 approval to build the reactor, a decision which interrupted the restart operations. Later, in 2005, Japan's Supreme Court reversed the ruling and gave the green light to restart the Monju reactor. So this ruling does not deal with the renewal of the operating licence but with the appeal system with regard to licensing decisions made by public authorities.

26. Lately a question of a different order has been put on the table in OECD member countries with a phase-out policy, i.e. whether licensees should be obliged to pay some type of compensation if it is decided to authorise long-term operation despite a phase-out decision. This is of course a political issue and not a legal one. In Belgium, permission for continuing to operate the three oldest nuclear reactors for another ten years beyond their 40th anniversary was linked to a tax levied on the operator. In the Netherlands, the operator agreed to invest around 250 million euros (EUR) in sustainable energy (renewable, energy saving and clean fossil fuels) in exchange for the authorisation to extend the lifetime of its reactor by 20 years. In Germany, the 2010 legislation extending the lifetimes of the existing reactors was linked to an obligation on the operators to pay substantial contributions to a new Energy and Climate Fund.

"intangible property" as opposed to being a "privilege".[27] In the case of a licence to operate a nuclear power facility, it was concluded that such a licence did not become intangible property but remained a privilege.

In other countries financial compensation may be considered. For example in Finland, according to Section 27 of the Nuclear Energy Act,[28] an operator whose application for an operating licence has been refused is entitled to reasonable compensation for the direct costs incurred in constructing the plant subject to two exceptions: first, if it has become impossible to respect Sections 6 (safety) and 7 (physical protection and emergency planning) of the Nuclear Energy Act in the operation of the plant and secondly, where the operator no longer has the economic and other means to carry out the activity safely and in accordance with the international law commitments made by Finland.

Financial compensation is also granted in Spain in accordance with the Act on Expropriations but only in a restricted situation.[29] Article 32 of the Spanish Nuclear Energy Act (Act 25/1964) provides that licences for nuclear and radioactive installations can be revoked for exceptional reasons of national interest. The revocation must be agreed by the Council of Ministers on the proposal of the Ministry of Industry, Tourism and Trade.

In Sweden, the 1997 Act on the Phase-Out of Nuclear Power (repealed in 2010) authorised the government to revoke the licence of any nuclear power plant as part of the "conversion of the energy system" but also provided for a substantial indemnity to be paid to the licensee in accordance with the Act on Expropriation. However, the amount of the indemnity was calculated on the basis of a reactor that is 40 years old,[30] and it was not clear whether an operator would have been entitled to financial compensation for a refusal of continued operation relating to a reactor that is older than 40 years.

In the Netherlands, for many years there was a political and legal controversy about the operating lifetime of the country's only operating nuclear power plant, Borssele. For some time, it was government policy that Borssele should be shut down in 2013, after 40 years of operation. This was opposed by the companies operating the plant. In June 2006, an agreement was signed between the government and the operators of the Borssele plant, the so-called "Borssele Covenant",[31] which extended the lifetime under certain conditions to 60 years, ending in 2033. In this covenant, it is expressly stated that surveys conducted by the competent Secretary of State had concluded that "legally enforcing the closure [in 2013] would lead to the State having to pay considerable damages".[32] On the other hand, the Borssele

27. Saulnier *v* Royal Bank of Canada [2008] S.C.J. No. 60.
28. Nuclear Energy Act 1987, No. 990/1987 as last amended by Act No. 769/2004 (reproduced in the Supplement to *Nuclear Law Bulletin No. 41*).
29. So far the Spanish government has not yet revoked an authorisation to operate a nuclear reactor. However, on one occasion the government had to compensate nuclear operators. In 1994, the government decided (Act 40/1994) to interrupt the construction projects of three nuclear units (Lemóniz, Valdecaballeros and Trillo II) and consequently revoked the construction licences. The holders of the construction licences were entitled to receive compensation for their investments and the corresponding financing costs. The compensation must be paid in a maximum of 25 years. More recently, the renewal of the operating licence for the Garoña nuclear reactor for four years instead of the ten years originally requested by the operator (NUCLENOR) has induced the operator and other stakeholders to lodge an appeal against the order of renewal, which has not been concluded yet.
30. See *Nuclear Law Bulletin No. 61* (1998/1), p. 86.
31. The "Borssele Covenant" is contained, as Annex 2, in the Kingdom of the Netherland's National Report for the fifth review meeting under the Convention on Nuclear Safety, 2010.
32. Borssele Covenant (see previous footnote), recital No. 8.

operators agreed to financial commitments to invest in "innovative" energy projects and to establish a fund to support such projects.

In Germany, the anti-nuclear policy of the government which was elected in 1998 led to discussions on whether nuclear operators would be entitled to compensation on the basis of the Constitution and the legal provisions regarding protection of property and investment should a phase-out be decided.[33] The discussions led to a compromise amongst nuclear operators and the German government, laid down in an agreement in 2001, which eventually resulted in the 2002 Phase-out Act. This act limited the lifetime of German reactors to the equivalent of 32 operating years and the operators agreed not to bring any claims for compensation.[34]

Today, the question is back on the table in Germany after the recent controversial developments (for more details see the country report on Germany in the annex to this article). In December 2010, legislation extended the lifetimes of nuclear reactors by the equivalent of 8 years (for plants commissioned by 1980) and 14 years (for the younger ones). Barely three months later, after the Fukushima accident in March 2011, the German government proceeded to a complete U-turn towards an accelerated phase-out that may even lead to more restrictive lifetime arrangements than those agreed and implemented in 2001/2002. The legal question inevitably arises whether operators are entitled to any compensation first, for investments which they might have made relying on the increased electricity volumes allocated to Germany's 17 nuclear power plants by the 2010 law, and secondly, for effects of the new legislation which may even be more restrictive than the original 2002 act.

Apart from these special circumstances in Germany, it is probably fair to conclude that in most OECD member countries a denial of long-term operation for a nuclear reactor aged 40 and beyond would not *per se* entitle its operator to financial compensation, although this is not excluded, as illustrated by the Borssele case in the Netherlands. On the contrary, and as mentioned previously, there is rather a tendency that nuclear operators will have to pay for the benefit of long-term operation. This, however, appears to be based on political grounds rather than legal ones.

B. Applying new safety standards to existing nuclear reactors

Safety requirements: which ones are relevant?

The decision on long-term operation is based on a safety review of the nuclear reactor concerned. Operators have to demonstrate that their plant is maintained in the physical condition as required by the licence, that the components are functional, that any degradation will be detected and that components will be

33. The relevant legal studies (all in German) were: Denninger, Verfassungsrechtliche Fragen des Ausstiegs aus der Nutzung der Kernenergie zur Stromerzeugung, 1999; Di Fabio, Der Ausstieg aus der wirtschaftlichen Nutzung der Kernenergie, 1999; Ossenbühl, Verfassungsrechtliche Fragen eines Ausstiegs aus der friedlichen Nutzung der Kernenergie, AoR 124 (1999), 1; Roßnagel/Roller, Die Beendigung der Kernenergienutzung durch Gesetz, 1998; Schmidt-Preuß, Rechtsfragen des Ausstiegs aus der Kernenergie, 2000.
34. The text of the agreement between the German government and the operators of nuclear power plants of 11 June 2001 is reproduced (in German) in: Posser/Schmans/Müller-Dehn, Atomgesetz, Kommentar zur Novelle 2002, Anhang 2. Chapter I contains the statement: "Federal government and utilities assume that this agreement and its implementation will not lead to compensation claims between the parties".

replaced if necessary. The crucial question in this section will be which safety standards are relevant for the safety review and how these standards are applied.[35]

Naturally, nuclear safety regulations develop over time in order to keep pace with new technical developments and lessons learnt from operating experience. Regulations and standards do not remain identical to those that were in force when the nuclear power plant was designed, constructed and commissioned. Hence, when continued operation is to be approved, the question arises: should one refer to the safety standards that applied at the time of the original licensing process or to the current, often higher standards? Is it sufficient for operators to "maintain" safety, or should they "improve" safety and follow the "state of the art"? It is important to differentiate because of the backfitting measures which will usually be more extensive and costly in the latter case.

The question of applying new, enhanced safety standards to existing nuclear power plants is not necessarily linked to continued operation. For each installation, one can practically start raising it as of the day of commissioning, when long-term operation is still far away. Normally there should be a consistent regulatory approach during the entire lifetime of the plant, both in the first decades of its operation and later during an extended period of long-term operation. However, in practice there may be additional requirements imposed on the operator during the administrative procedure to grant long-term operation. Quite naturally compliance of plant design and components with relevant standards becomes more of an issue when the nuclear power plant reaches a certain age because of the substantial developments in science and technology and the underlying regulations and standards.

Finally, the perspective will change once the plant operates longer than originally foreseen: while during the normal operating period it is upon the regulator to substantiate non-compliance with safety requirements if it wants to oblige the operator to implement remedial measures, in a lifetime extension process it is on the operator to demonstrate compliance with those safety requirements which the regulator considers relevant.

Improving versus maintaining safety

New nuclear power plants obviously need to comply with the newest and latest applicable safety standards. The question is whether and how such standards also apply to existing nuclear power plants? The question can be answered in two different ways: first that new requirements are applicable to older plants leading to safety upgrades and backfitting ("improving safety" response) and secondly that the original standards must be kept ("maintaining safety" response).[36]

As always with short and succinct denominations, there is a risk of misinterpretation. The "maintaining safety" concept may equally require backfitting, namely if findings (e.g. through an operating incident) show that there is a deficiency in the licensing basis which was not detected before. In such cases, backfitting measures would "restore" the safety level to comply with the original intentions of the licence, thus maintaining safety. "Improving safety" by contrast means that the safety level of the plant is raised beyond the definitions and expectations given in the original licence by applying new, enhanced standards.

35. This question is discussed in great detail in Raetzke, C. and Micklinghoff, M., *Existing Nuclear Power Plants and New Safety Requirements, An International Survey*, Heymanns Verlag, 2006 (bilingual edition German-English).
36. See the OECD/NEA's guidance report "Improving versus Maintaining Nuclear Safety", originally published in 2002 and now included in *Improving Nuclear Regulation, NEA Regulatory Guidance Booklets*, 2011, available at www.oecd-nea.org/nsd/docs/2011/cnra-r2011-10.pdf.

Some OECD member countries officially have a concept of continuous "improvement" of the safety level of existing plants. One example is France where the regulatory authority, the *Autorité de sûreté nucléaire* (ASN) has developed an "approach of constant enhancement of the safety of existing plants". This regulatory approach is reflected in Article 29 of the 2006 Act on Transparency and Safety in the Nuclear Field, which requires the operator of a nuclear reactor to perform a PSR every ten years, taking into consideration operating experience and the "evolution of knowledge and regulations". This in practice means comparing the plant with the safety features included in new reactor designs, like the European pressurised reactor, and subsequently raising the safety level of the plant.[37]

In Finland, the Nuclear Energy Act (as amended in 2008) contains a clause holding that "for the further development of safety, measures shall be implemented that can be considered justified considering operating experience and the results of safety research as well as the advancement of science and technology".[38] This means that Finnish nuclear power plants basically have to upgrade components, systems or procedures if this is warranted by new developments and experience, provided this can be done in a reasonable way ("justified").

In the United Kingdom, nuclear power plants have to comply with the ALARP ("risk as low as reasonably practicable") principle as laid down in the 1974 Health and Safety at Work etc. Act.[39] ALARP is a shifting yardstick which can change if new scientific or technological developments make safety measures "reasonably practicable" which were not so before, or if they show that certain risks are greater than presumed and countermeasures are necessary. However, the implementation of any new measures has to be reasonable.

The Euratom Directive 2009/71 establishing a Community framework for the nuclear safety of nuclear installations[40] introduced the notion of "continuous improvement of nuclear safety" in Article 1 as an objective of the directive. There is, however, no definition and no provision in the directive which allows its concrete application to existing installations; this remains in the responsibility of national legislation and regulation.[41]

In none of the frameworks mentioned above does the concept of "improving safety" mean that new safety standards are directly applied to existing installations. Normally, if new standards are adopted, it will be assessed if and to which extent the existing nuclear reactor deviates from them. In some cases, the operator will be able to demonstrate that his/her plant meets the new requirements, for example

37. See ASN's Annual Report 2010, p. 319: "The objective of the safety reassessment is to enhance the level of safety at the installations, in particular, taking into account the requirements applicable to newer installations" (unofficial translation). The report is available at http://rapport-annuel2010.asn.fr.
38. Finnish Nuclear Energy Act, Article 7a; the act is available in English at www.edilex.fi/stuklex/en/lainsaadanto/19870990.
39. Section 2 of the 1974 Health and Safety at Work etc. Act reads: "(1) It shall be the duty of every employer to ensure, so far as is reasonably practicable, the health, safety and welfare at work of all his employees". In Section 3 this duty is extended to encompass persons outside the installation: "(1) It shall be the duty of every employer to conduct his undertaking in such a way as to ensure, so far as is reasonably practicable, that persons not in his employment who may be affected thereby are not exposed to risks to their health or safety". The formulation in the act that risks have to be averted "so far as is reasonably practicable" has the same meaning as the wording (more common in practice) that risks should be "as low as reasonably practicable" (ALARP).
40. Official Journal L 172, 2 July 2009, p. 18-22.
41. See Garribba, M., Chirteş, A. and Nauduzaite, M., "The Directive Establishing a Community Framework for the Nuclear Safety of Nuclear Installations: The EU Approach to Nuclear Safety", *Nuclear Law Bulletin No. 84* (2009/2), p. 31 *et seq*.

because safety margins have been included in the design. If the assessment results in a true deviation, this does not automatically mean that the nuclear reactor has to be backfitted. Often it is possible to demonstrate that the existing solution, even if it does not exactly correspond to the new regulations, provides for a similar level of safety. If this is not the case, backfitting will be required provided that it is reasonable: the costs and efforts involved with backfitting must be proportionate to the safety enhancement.

There are also relevant examples for a regulatory framework based generally on "maintaining safety", the most prominent being the United States. The US Atomic Energy Act requires nuclear installations to ensure "adequate protection".[42] Once the operating licence has been granted, basically only new findings – which show, for example, that an unforeseen hazard exists – can lead to the conclusion that the safety level of an existing plant is no longer sufficient; in this case, action must be taken to re-achieve compliance with existing safety requirements (compliance backfit). A requirement leading to an actual improvement in design following modern developments is possible, but the NRC has defined strict limits by establishing the backfitting rule under 10 CFR 50.109 which imposes very stringent conditions on the NRC staff for justifying backfitting requirements aimed at raising the safety level beyond the design basis; such are deemed to be the exception and not the rule.

In line with this approach, the licence renewal procedure from 40 to 60 years (pursuant to 10 CFR 54) is not a vehicle for applying new requirements. Instead, the applicant only has to show that the ageing of structures and components is being mastered ("strictly ageing").[43] The operator will implement an ageing management review; the current licensing basis is not altered except for the inclusion of an ageing management programme adopted to address the extended period of operation.

Similar to the United States with its concept of "adequate protection" and somewhat different from other European countries, German nuclear law is based on the notion of a fixed requirement for nuclear safety, namely the "precaution which is necessary in the light of the state of the art in science and technology" (or, in short, "necessary precaution"), as defined in Article 7 of the Atomic Energy Act. Even though, legally speaking, this is not a dynamic yardstick for existing plants, in practice the German regulators and operators agree that there should be safety improvements, and the operators have performed substantial backfitting measures in order to keep their plants in line with current developments.[44] The latest amendment to the Atomic Energy Act in December 2010 has introduced an additional obligation on licensees to implement safety features "according to the progressing state of the art in science and technology". The legal wording – and the official rationale of the amendment[45] – makes clear that this does not mean a fundamental change in approach. It is an additional layer of safety beyond the "necessary precaution". The latter continues to mark the level at which the plants are basically "safe enough".

42. Section 182 para. (a) of the Atomic Energy Act says that "[the applicant has to demonstrate that] the utilization… of special nuclear material will be in accord with the common defence and security and will provide adequate protection to the health and safety of the public".
43. In this context, it is important to note that the original 40-year term was selected on the basis of economic and anti-trust considerations, not technical limitations; see NRC NUREG 1850, Frequently Asked Questions on Licence Renewal of Nuclear Power Reactors, 2006, No. 1.15.
44. See Raetzke/Micklinghoff, *op. cit.*, pp. 21 *et seq.*
45. BT-Drucksache 17/3052, p. 13.

To summarise, in practice OECD member countries tend to steer the middle course between the alternatives of "improving" *versus* "maintaining" safety, requiring existing nuclear reactors to "reasonably" improve safety. An extreme position – that a nuclear reactor would, during its lifetime, always have to fully comply with the newest, currently valid standards, as if it were a new plant – is not taken in any country.

C. Long-term operation after the Fukushima accident

On 11 March 2011, an earthquake measuring level 9.0 on the Richter scale followed by a tsunami hit the six units of the Fukushima Daiichi nuclear power plants in Japan. This combination of events led to a loss of off-site power supply and of residual heat removal, resulting in damage to fuel assemblies in units 1 to 4. In the days and weeks after and ever since, staff has been labouring to restore cooling and to prevent and mitigate the spread of radioactivity to the environment.

This accident, which the Japanese regulatory authority subsequently rated 7 on the International Nuclear and Radiological Event Scale (INES), the worst since Chernobyl, has triggered immediate reactions throughout the world. In the European Union, "stress tests" co-ordinated by the EU institutions according to criteria developed by the Western European Nuclear Regulators Association (WENRA) and endorsed by the European Nuclear Safety Regulator Group (ENSREG)[46] will be conducted jointly by the national regulators, to be finished by the end of the year. Many individual countries, both inside and outside Europe, have already announced national reviews of the safety of their nuclear power plants in the light of the Fukushima accident.[47]

Fukushima has sparked a general discussion on nuclear power and will undoubtedly have a huge impact on the nuclear safety regime worldwide. The accident will affect all plants in operation and will extend to new designs, which will all be re-assessed in the light of lessons learnt from Fukushima. The accident is particularly relevant to the topic of long-term operation of nuclear power plants since the four gravely affected units at Fukushima Daiichi (units 1 to 4 of altogether 6 units) went into commercial operation in 1971, 1974, 1976 and 1978 respectively,[48] with media reports stating that the nuclear regulator had agreed to a 10-year extended operation for the 40-year-old unit 1 in February 2011, only a few weeks prior to the accident.[49]

The question that logically follows is whether the accident requires a change of the regulatory and legal regime governing long-term operation, or even invalidates the concept of long-term operation?

First reactions from regulators indicate that the safety review for extended operation will from now on be more thorough than before. Certainly, the issues highlighted by Fukushima – the impact of serious natural disasters, the way the plant design copes with severe accident situations such as total loss of electric

46. The criteria are available on WENRA's website www.wenra.org.
47. Examples are the review entrusted to M. Weightman, HM Chief Inspector of Nuclear Installations, in the United Kingdom and the "90-day review" done by the US Nuclear Regulatory Commission. More information about the Weightman report is available at www.hse.gov.uk/nuclear/fukushima, and about the NRC response to Fukushima at www.nrc.gov/japan/japan-info.html.
48. See the IAEA Country Nuclear Power Profiles, 2002 edition, Japan, Table 8 available at www.pub.iaea.org/mtcd/publications/pdf/cnpp2003/cnpp_webpage/PDF/2002/index.htm#COUNTRY%20PROFILES.
49. See *New York Times*, 21 March 2011; www.nytimes.com/2011/03/22/world/asia/22nuclear.html.

power and a loss of the ultimate heat sink, and others – will be subject to intensive scrutiny. This may indeed lead to a denial of long-term operation in some cases or to long-term operation only being granted subject to substantial backfitting, which may make it unattractive for their owners to continue operation.

According to the authors, however, this does not mean that a restructuring of the existing regulatory system and legal principles governing long-term operation of nuclear power plants, as they are described in this article, is warranted. Rather, the current system needs to integrate the lessons learnt from Fukushima at several levels in order to avoid catastrophic accidents in the future. Such an integration of enhanced safety criteria is an important function of the regulatory and legal system for long-term operation, which has been conceived so as to oblige regulators and operators to take into account the lessons learnt from accidents.

In a first stage, the causes of the Fukushima accident need to be thoroughly examined and its consequences accurately assessed. In a second stage, the lessons learnt from Fukushima need to be incorporated in international and national safety standards and in the operators' own requirements and thus need to become an integral part of the ten-yearly PSRs and of any safety review done specially at the occasion of a lifetime extension.

As suggested above, these enhanced safety criteria may lead to some plants being decommissioned because continued operation is not authorised or operators are restraining from costly backfitting investments. Beyond this effect, which is very much dependent on the individual circumstances of each case, in some countries the Fukushima accident may lead to a change in nuclear policy and a general reluctance *vis-à-vis* long-term operation. The most striking example is Germany. This, however, is a political decision which is outside the scope of the legal and regulatory mechanisms described in this article.

The Fukushima accident, as sad and distressing it may be, will hopefully have the positive effect of strengthening the international nuclear safety regime. After the 1986 Chernobyl accident, nuclear law and the international nuclear community took a big step forward with the adoption of several international instruments.[50] After Fukushima, several initiatives have already been started towards a common approach to learning the lessons of this accident. This may also lead to a more unified approach on the requirements for long-term operation.

D. Conclusions

Over the last ten years, many stakeholders have announced an imminent nuclear revival or "renaissance" driven by rising fossil fuel prices and concerns about meeting greenhouse gas emission limits and security of supply on electricity markets. Although new nuclear reactors are being built in OECD member countries, the fate of existing plants seems to take a more prominent role in recent times for a variety of reasons. In OECD member countries, a substantial number of nuclear power plants are over 30 years old. In several of those countries, governments agreed to authorise continued operation of individual plants beyond the initial time

50. Conventions established in the wake of Chernobyl are the Convention on Early Notification of a Nuclear Accident, the Convention on Assistance in the Case of a Nuclear Accident or a Radiological Emergency (both 1986), the Convention on Nuclear Safety (1994) and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (1997). The post-Chernobyl evolution of nuclear law and international treaties is discussed in great depth in *International Nuclear Law in the Post-Chernobyl Period*, a joint report by the OECD Nuclear Energy Agency and the International Atomic Energy Agency, 2006.

frame for which they are licensed or designed while in others discussions have started in that direction.

Unless there is an express phase-out policy, the basic understanding is that nuclear power plants may be operated as long as they are safe. In all OECD member countries with nuclear installations a regulatory framework exists that is aimed at ensuring safe operation, both technically and environmentally. Safety must be demonstrated throughout the lifetime of a nuclear plant. However, safety assessments get more thorough and demanding as the plants grow older, and particularly when they approach the age for which they were originally designed.

An important question in this respect is whether or not it is in the public's interest to allow the continued operation of nuclear power plants or whether new build should be promoted or whether nuclear power plants should be phased out altogether. In this regard public authorities that opt for authorising long-term operation must make sure that nuclear power plants comply with societal expectations. The establishment of environmental impact assessments in the context of lifetime extension procedures is an element that denotes these changing expectations towards an effective regulatory framework. New legal mechanisms therefore reflect an extended definition of nuclear safety throughout the operating lifetime of nuclear installations.

Additional incentives for upgrading safety requirements come from operational experience and from accidents like the recent one in Fukushima. In the opinion of the authors, the Fukushima accident in itself does not require a change of the existing legal and regulatory regime governing long-term operation. The regime has been conceived so as to oblige regulators and operators to take into account the lessons learnt from accidents. In this regard, the Fukushima accident will most likely lead to more stringent criteria for granting long-term operation and to requirements for substantial upgrading of reactor designs to cope with external events and with situations like the loss of electric power or the loss of the ultimate heat sink.

While a regulatory framework does exist in all OECD member countries, national perspectives towards a continued use of nuclear energy differ from country to country. The legal mechanisms we presented in this study are evidence of institutional and cultural differences. Some national frameworks provide for fixed-term operating licences of nuclear reactors while others establish operating licences with an indefinite term. All national approaches that we examined highlight the importance of the effective assessment of safety factors as established by the operating licence. In fact, in all countries government officials and nuclear regulators will only agree to long-term operation of nuclear reactors if all systems, structures and components continue to function as determined by the nuclear reactor's operating licence.

Article 14 of the Convention on Nuclear Safety is the legal cornerstone of the international effort towards ensuring nuclear safety and implementation of the safety principles, including for long-term operation of nuclear reactors. In this regard periodic safety reviews have become a key regulatory instrument to judge the appropriateness of long-term operation of nuclear reactors. They have been promoted by the IAEA for many years to ensure an efficient division of roles between the licensee and the regulatory body in the field of ageing management along the lines prescribed by the Convention on Nuclear Safety. PSRs have been implemented in the legislation or in the licences of almost all OECD member countries.

In most OECD member countries the decision concerning the extension of the validity of an operating licence may be appealed, either through a court review or an out-of-court review by the regulatory authority. The issue of financial compensation

to the operator in case of a permanent shutdown of reactors for reasons other than safety seemed, in practice, less relevant once the reactor has reached its design lifetime. Apart from the special situation in Germany, it is probably fair to conclude that in most OECD member countries a denial of long-term operation for a nuclear reactor aged 40 and beyond would not *per se* entitle its operator to a financial compensation, although this is not excluded, as illustrated by the Borssele case in the Netherlands. Actually, there is rather a tendency in the opposite direction with nuclear operators having to pay for the benefit of long-term operation.

Despite the different legal and regulatory approaches towards long-term operation, this study came to the conclusion that, in reality, there are not vast differences among OECD member countries in the outcome of requests for long-term operation. This is illustrated by the various positions on the question whether the plant design has to be reviewed against more modern standards when deciding upon long-term operation. Although the approach of nuclear regulators in OECD member countries is based, at least in theory, on different concepts of "maintaining safety" or "improving safety", in practice all countries tend to opt for the middle course between both alternatives, requiring existing nuclear reactors to "reasonably" improve safety.

ANNEX: COUNTRY REPORTS

Canada

Canadian nuclear fleet: Canada has 18 nuclear power reactors in operation. All power reactors in Canada are of CANDU type (pressurised heavy water reactor, PHWR). The oldest operating power reactor was connected to the electricity grid in 1971 (PICKERING-1). The average length of operation of the 18 nuclear power plants is 26 years.

Status of licence: There is no limit in term for an operating licence but the licences have to be renewed periodically according to the conditions of the operating licence. There is no requirement of a formal PSR, but the Canadian Nuclear Safety Commission (CNSC) requires nuclear facilities to regularly update their facility description and safety analyses. In addition, a comprehensive safety assessment is submitted in support of licence renewal. Also, operators have to perform an integrated safety assessment comparable with a PSR as part of any refurbishment activity for the purposes of life extension.

Continued/long-term operation: As part of licence renewal, licensees are required to systematically review key safety areas. But this licence renewal process does not necessarily comprise a comprehensive analysis of the safety features against all modern standards that would apply to new nuclear power plants. A licensee may nevertheless choose to implement a project for the purpose of extended or long-term operation of the nuclear facility beyond its implicit design life. As a result, the CNSC would require that the licensees perform an integrated safety review (ISR). The CNSC approach to ISR is described in CNSC regulatory document RD-360 "Life Extension of Nuclear Power Plants", which reflects IAEA Guide NS-G-2.10. In addition, under the Canadian Environmental Assessment Act, the life extension project may be subject to an environmental assessment. Where such assessment is required, a decision that the life extension project will not have significant adverse environmental effects is needed prior to any licence renewal.

Safety requirements during continued/long-term operation: The licensee considers all pertinent safety factors and prepares ISR safety factor reports for submission to the CNSC. The commission then reviews the reports for acceptance. The final results are incorporated (together with the results of the environmental

assessment) in an integrated implementation plan which indicates the schedule for implementing the safety improvements. A global assessment report is finally prepared for acceptance by the commission. After the report has been accepted, the licence is amended to include new licence conditions to be met in the return-to-service phase of the project. In summary, the ISR involves an assessment of the current state of the plant with a view to determine the extent to which the plant conforms to modern standards and practices, and to identify any factors that would hinder safe long-term operation. It enables identification of reasonable and practical modifications that should be made to systems, structures and components, to enhance the safety of the facility to a level approaching that of modern nuclear power plants, and to allow for long-term operation.

Current situation and outlook: Canadian authorities and operators have made the decision to extend the operating life of a number of reactors by refurbishing them. Starting in 1995, the four Bruce A units and the four Pickering A units were shut down. Of these eight, four have been refurbished and returned to service, two are currently undergoing refurbishment while Pickering A2 and A3 will not be restarted. In February 2010, Ontario Power Generation decided against full refurbishment of the Pickering B units, but will spend CAD 300 million on a "limited refurbishment" in order to guarantee a safe operation for ten years after their initial licence term (mid-2013) before closing and decommissioning them. Newer Darlington reactors are scheduled for full refurbishment starting about 2016 and a consequent 30-year life extension. Point Lepreau reactor has been undergoing full refurbishment since 2008 and is now expected to be back in service late in 2012 with an expected closing date in 2032. Finally, the Gentilly 2 reactor will be refurbished starting in 2012 as an alternative to closing it in 2011, thereby extending its operating life to about 2040.

After the Fukushima accident, CNSC has ordered operators of all nuclear power reactors to review safety and see what lessons can be learnt. Legally, this is based on General Nuclear Safety and Control Regulations 12(2).[51] All licensees are requested to re-examine safety cases for external hazards such as seismic, flooding, fire and extreme weather events.

Finland[52]

Finnish reactor fleet: There are currently 4 units in operation, two PWRs of Russian design in Loviisa (commissioned 1977 and 1980) and two BWRs of Swedish design in Olkiluoto (commissioned 1978 and 1980).

Status of licence: According to Section 24 of the Nuclear Energy Act, the operating licence shall be granted with a fixed term (and has to be extended periodically). There is no limit to the number of extensions and to the overall lifetime of the installations. For the Finnish reactors, the operating licences were at first granted with a term of four to seven years (depending on the reactor), then the term was extended to ten years. The latest licence extensions, those which are valid today, were granted for a period of 20 years. In 1998, the two Olkiluoto units received an extension to 2018. The licences for Loviisa were extended, in 2007, until 2027 (unit 1) and 2030 (unit 2).

Continued/long-term operation: According to the Finnish system, there are two occasions to assess whether the plants still comply with relevant requirements: the

51. General Nuclear Safety and Control Regulations (SOR/2000-202).
52. For a general introduction into the system of Finnish nuclear regulation, giving particular attention to the question of applying new requirements to existing plants, see Raetzke/Micklinghoff, *op. cit.*, pp. 90-105.

procedure of periodic licence renewal (see above), and the PSR which is performed every ten years according to international standards. At the time when the licence extensions were granted for ten years, both processes were linked and the PSR became the prerequisite for the extension. When the licences for all reactors were extended by 20 years (see above), a licence condition was added obliging the operators to perform intermediate PSRs: Olkiluoto in 2008, Loviisa in 2015 and 2023.

Safety requirements during continued/long-term operation: Finnish safety requirements are seen to embody a "principle of continuous development". From the early 1990s, this was contained in a government decision (Decision 395/1991, Section 27). In 2008, the principle was enhanced by including it in the amended Nuclear Energy Act. Article 7a of the amended act contains the following paragraph: "For the further development of safety, measures shall be implemented that can be considered justified considering operating experience and the results of safety research as well as the advancement of science and technology". This means that Finnish nuclear power plants basically have to upgrade components, systems or procedures if this is warranted by new developments and experience, provided this can be done in a reasonable way ("justified").

In practice, a main driver for improvement is the constant development of nuclear safety guidelines in Finland, the so-called YVL guides issued by the Finnish radiation and nuclear safety authority (STUK). These guides are regularly updated with a view to the new build projects ongoing or planned in Finland but are not legally binding. A new YVL guide is meant to apply directly only to new plants. However, the existing installations are checked by their operators – and in turn by STUK – to which extent they can or should also be adapted to comply with the new rules. There is a very formal and transparent procedure for this assessment.

Current situation and outlook: As explained above, the licences for the two Loviisa units have already been extended to 2027 and 2030, respectively, taking them to a lifetime of 50 years, 20 years more than the postulated design lifetime of these reactors of Russian design. Both Olkiluoto reactors are expected to be operated for 60 years; this would mean that the licence extension due in 2018 would be for another 20 years.

Following the Fukushima accident, Finland's Ministry of Economy has asked STUK to conduct a review of nuclear facilities' emergency preparedness procedures.

France[53]

French reactor fleet: There are currently 58 power reactors in operation. All of those reactors are PWR of three standard types: there are 34 reactors with a gross capacity of 900 MWe, 20 with a gross capacity of 1 300 MWe and 4 with a gross capacity of 1 450 MWe. The oldest operational reactors are the Fessenheim 1 and 2 reactors which were connected to the electricity grid in 1977.

Status of licence: In France, the operating licence for a nuclear reactor does not set a limit for service life. Nevertheless the ageing management process remains an integral part of the installations' operating life as Article 29 of the 2006 Nuclear Transparency and Safety Act (TSN Act) requires that the operator of a nuclear reactor perform a safety review of the facility every ten years. However, the decree of approval may set a different frequency if the specific facility warrants.

53. For a general introduction into the system of French nuclear regulation, giving particular attention to the question of applying new requirements to existing plants, see Raetzke/Micklinghoff, *op. cit.*, pp. 52-70.

Continued/long-term operation: The safety review is the occasion for an in-depth assessment of the facility. Such assessment must include the following:

- a "conformity examination", which involves an in-depth review of the state of the facility in order to verify that it complies with all applicable safety requirements; and
- a "safety re-assessment" of the facility in order to improve its safety level, notably by comparing the applicable requirements with those being enforced for more recent facilities and by taking into account national as well as international feedbacks.

This review should assess the situation of the facility under the rules applicable to it and update the assessment of the risks or disadvantages that the facility poses to the interests mentioned in Section I of Article 28 of the TSN Act taking in particular account of the condition of the facility, the experience gained during the operation, the development of competence and the rules applicable to similar facilities. After analysing the report containing the licensee's conclusions and in which he/she proposes to correct the deficiencies or to improve the facility's safety, the regulator *Autorité de sûreté nucléaire* (ASN) may impose new technical requirements and communicates to the competent ministers its nuclear safety report.

Safety requirements during continued/long-term operation: The ASN follows an approach of "constant enhancement of the safety of existing plants". In the framework of the "safety re-assessment" performed during a PSR, the plant is compared with more recent designs and benchmarked against the current national and international standards. This approach, however, is implemented only with respect to selected issues which are reasonably chosen and reviewed. For example, specific safety features of the EPR, which is the most modern French design under construction in several countries, would be selected to assess whether the existing installation should be upgraded accordingly. An example for new or changed international requirements are the WENRA safety reference levels adopted in 2009 or the revised IAEA safety standards. These comparisons and benchmarks may lead to adopting a programme to implement backfitting measures in the years following the PSR. One specific French aspect is the high degree of standardisation (the 58 reactors in operation belong to only three standard types) so that safety issues are reviewed, and possible backfits are implemented, in a generic manner applying to a number of reactors.

Current situation and outlook: In 2009 the ASN approved EDF's safety case for a 40-year operation of the 900 MWe units, based on generic assessment of the 34 reactors. However, this general assessment does not take into account the specific features of each reactor. ASN's opinion will therefore be supplemented by the verifications carried out during the third ten-year inspection of each reactor and by an examination of the reactor safety review, which will lead to a position that will be taken for each reactor individually.

In November 2010, ASN approved continuing operation of reactor 1 at the Tricastin nuclear power plant for an additional ten years after 30 years in service. It is the first reactor in the French nuclear fleet to be subject to a safety review 30 years after its initial licensing. In 2011, the ASN will provide the government with its opinion regarding continued operation of Fessenheim-1 for a further ten years. The discussion about extending operation beyond 40 years has started.

After the Fukushima accident, as in all other countries, a special safety review for all existing nuclear power plants was implemented. The ASN stated it had suspended the "post-40 review" and was likely to introduce enhanced requirements for any lifetime extension beyond 40 years.[54]

Germany[55]

German reactor fleet: Currently, 17 units have an operating licence, 11 pressurised water reactors (PWR) and 6 boiling water reactors (BWR). They started commercial operation between 1975 and 1989. The average age of the fleet is roughly 29 years.

Status of licence: The operating licences of the German nuclear reactors were issued without a term. The principle was that they were allowed to operate as long as they comply with the relevant legal and regulatory requirements. In 2002, the so-called Phase-out Act amending the 1959 Atomic Energy Act introduced a limitation: the "authorisation to produce energy" was to expire after the generation of a volume of electricity as individually specified for each plant in a schedule in an appendix to the act. These volumes were calculated so as to correspond to an operating life of roughly 32 years. The nuclear operating licence itself remained, legally speaking, unlimited.

After a new government had taken over in 2009, a new act amending the 2002 amendment came into force on 14 December 2010. This act did not globally repeal the phase-out legislation of 2002. It considered nuclear to be a "bridging technology" into a renewables future and it kept the general system of limiting nuclear electricity production introduced in 2002. However, it extended the lifetimes by allotting *additional* electricity volumes. For the "older" reactors, commissioned up to 1980, these extra allotments correspond to roughly 8 years of operation; for the newer reactors, they add up to about 14 years of additional operation. The lifetime extension was linked to extensive contributions by the operators to a new energy and climate fund (starting in 2017, but with down-payments from 2011 onwards).

After the Fukushima accident, a dramatic turnaround occurred. On 15 March 2011, three days after the events in Japan, Chancellor Merkel announced a "moratorium" on the lifetime extension as established by the 2010 Act; this was combined with an enforced shutdown of the seven oldest German reactors, declared to be temporary. On 6 June 2011, the German cabinet endorsed draft legislation repealing the additional electricity volumes in the 2010 Act. Additionally, in marked contrast even to the 2002 phase-out legislation, strict shutdown dates are introduced. The seven reactors which went offline after the accident at Fukushima, plus the nuclear power plant at Krümmel which has been offline for extensive repairs since 2007, will have to be decommissioned immediately when the new legislation takes effect (foreseen in July 2011). For the nine remaining plants, the draft act contains individual shutdown dates, ranging from 2015 to 2022. The 2002 legislation (and the 2010 extension) were based on the allotment of electricity volumes and the possibility of transfers among units, leading to some flexibility in shutdown dates. In these respects, the new legislation would be even stricter than the 2002 phase-out act, and it seems that some units will not be able to entirely produce the 2002 electricity allotment prior to final shutdown.

54. *Nucleonics Week* 14 April 2011, p. 3.
55. For a general introduction into the system of German nuclear regulation, giving particular attention to the question of applying new requirements to existing plants, see Raetzke/Micklinghoff, *op. cit.*, pp. 12-29.

Continued/long-term operation: There is no specific administrative procedure for long-term operation, as the licences are unlimited and the additional electricity production rights were allotted directly in the legislation. German nuclear power plants are subject to the usual ongoing inspection and review processes. According to the Atomic Energy Act, they have to perform a PSR every 10 years. As the plants get older, management and control of ageing issues will become more prominent in these reviews and assessments. Also, there is an evaluation whether there could be some design adjustments in order to further increase safety.

Safety requirements during continued/long-term operation: The overarching safety standard as prescribed in the Atomic Energy Act is that "every precaution has been taken that is necessary in the light of the state of the art in science and technology to prevent damage resulting from the construction and operation of the installation" (Article 7 para. 2). More concrete requirements are contained in ordinances and in regulations issued by the federal regulator, the Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). If the authority finds that, in light of current knowledge, there is a deficit in safety of operating plants, it can demand additional measures to be taken by the operator. In addition, the 2010 Amendment to the Atomic Energy Act has introduced a new article (Section 7d) putting an obligation on licensees to implement safety features "according to the progressing state of the art in science and technology… for the further prevention of risks to the general public". The wording makes clear that this is meant to be an additional layer of safety beyond the "necessary precaution" which is guaranteed by all plants.

Current situation and outlook: According to lifetime forecasts based on the 2010 Act, the existing German nuclear reactors would have been shut down successively from 2018, with the latest (most modern) units going off line well in the 2030s.

As has been explained above, the new draft legislation would mean that eight reactors would be decommissioned immediately, with the remaining units following stepwise from 2015 to 2022. A discussion on compensation has started, given the fact that this does not only entail a plain repeal of the 2010 legislation but in some cases even means that the 2002 electricity allotments cannot be entirely produced prior to shutdown.

Japan

Japanese reactor fleet: At the time of the 11 March earthquake and tsunami, there were 54 reactors in operation in Japan. Thirty of them are BWR, while the other 24 are PWR. Older operating reactors achieved criticality at the beginning of the 1970s (TSURUGA-1 BWR and MIHAMA-1 PWR). Nineteen reactors are over 30 years old. The average length of operation of the 54 nuclear power plants is 24 years.

Status of licence: There is no limit in term for the licences of nuclear installations granted on the basis of the 1957 Law for the Regulation of Nuclear Source Material and Reactors. The basic philosophy is that safety reassessments and safety inspections are organised at periodic intervals and that the plant may only continue to operate if the safety reassessment or inspection is judged successful by the safety authority.

Continued/long-term operation: Long-term operation is based on periodic inspections of the most critical safety components every 13 months (Electric Utility Act). The inspections are basically "overall" inspections of the plant, and take about 90 days. Periodic inspections and periodic licensee's inspections of facilities and components are performed so that the status of degradation of their functions and performance is appropriately checked and proper remedies are performed using up-to-date technologies and materials, as necessary, in order to ensure safety.

In addition to the inspections, PSRs which focus on the review of the plant's safety factors are held every ten years. The PSR is an activity in which the operator evaluates "the implementation status of fitness-for-safety activity and the incorporation status of the latest technologies into the fitness-for-safety activity at the nuclear reactor facility" according to Article 15-2 of the 2006 Rules for Establishment and Operation of Commercial Nuclear Power Reactors. The Nuclear and Industrial Safety Agency (NISA) reviews the conclusions of the operator following his/her safety analysis. The 30-year and 40-year reviews are particularly important in terms of the evaluation of ageing mechanisms.

Safety requirements during continued/long-term operation: The purpose of the PSRs is to evaluate the level of implementation of the latest technical knowledge in the field of safety in addition to the corrective actions that result from the periodic inspections. More generally, the licensee is required to document the long-term maintenance programme in the operational safety programme and obtain approval of the Ministry of Economy, Trade and Industry (METI). In particular, at the occasion of the third PSR an ageing management technical evaluation (AMTE) is to be conducted. On the basis of the results of this evaluation, the licensee must establish a ten-year programme for the maintenance management of the nuclear installation (long-term maintenance programme) to be implemented in the following ten years. This programme is based on the monitoring of a number of ageing phenomena after 30 years of operation. The programme is to be reviewed and renewed after 40 years of operation and 50 years of operation. Japan's ageing management programme is characterised by a process of continuous infrastructure improvement on the basis of the best available technologies assuming a 60-year lifecycle in order to maintain and improve safety.

Current situation and outlook: Recently, the first lifetime extensions beyond 40 years have been approved: in March 2010 for Tsuruga-1 and in February 2011 for Fukushima Daiichi 1, which was shortly hereafter hit by the natural disaster and will not go online again. Following the nuclear accident at the Fukushima Daiichi nuclear power plant caused by the 11 March earthquake, a NISA edict, issued on 30 March, requires all existing Japanese nuclear power plants to provide details of their current emergency response procedures and details of plans for improvement as soon as possible. It is too early to assess the impact of the Fukushima event on the Japanese policy concerning long-term operation.

United Kingdom[56]

UK reactor fleet: There are currently 19 units in operation. Four of them are Magnox reactors, the last remains of a large Magnox fleet, to be decommissioned by end of 2012. The bulk of the fleet, 14 units, are AGRs (advanced gas cooled reactors). One unit, Sizewell B, is a PWR (pressurised water reactor). The ages range from 44 years for the oldest still operating Magnox unit (Oldbury 1) to 15 years for Sizewell B. The average age of the fleet is roughly 30 years (28 years for AGRs).

Status of licence: The nuclear site licence does not contain a term. It is meant to cover all stages of a plant's life: construction, commissioning, operation, decommissioning and dismantling. Under the licence, the licensee is obliged (via a standard set of licence conditions) to make and implement arrangements to ensure that all relevant safety issues are addressed in safety cases which are adapted to the relevant stages (construction, operation, etc.). These safety cases are in turn

56. For a general introduction into the system of UK nuclear regulation, giving particular attention to the question of applying new requirements to existing plants, see Raetzke/Micklinghoff, *op. cit.*, pp. 106-127.

assessed by the nuclear regulatory authority, the ONR (Office for Nuclear Regulation).[57]

Continued/long-term operation: The safety case for an operating nuclear reactor is reviewed on the occasion of every statutory outage (every one to three years) and especially during a periodic safety review, which takes place every ten years. The aim of the PSR is to show that the plant can be safely operated for the next ten years. If this is demonstrated to ONR's satisfaction, the ONR will issue a statement that, provided the improvements identified in the review are implemented and provided the routine inspections continue to be satisfactory, the operation may continue till the next PSR. There is no special procedure for "lifetime extension", and no specific consent or approval is needed. In the PSR of an ageing reactor, the licensee normally commits to undertake interim reviews of systems, structures and components and to implement monitoring programmes for ageing phenomena.

Safety requirements during continued/long-term operation: Nuclear power plants have to comply with the ALARP (risk as low as reasonably practicable) principle as laid down in the 1974 Health and Safety at Work etc. Act. When reviewing the safety case (see above), the licensee will have to assess whether design and operation of his/her plant remain in compliance with ALARP. ALARP can over time lead to new requirements in case new scientific or technological developments make safety measures "reasonably practicable" which were not so before, or if they show that certain risks are greater than presumed and countermeasures are necessary. However, as the implementation of any new measures has to be reasonable, the authority will not demand backfitting which thoroughly alters the existing design features; the focus is rather on eliminating weaknesses or deficiencies in the existing design.

Current situation and outlook: According to published data, the expected shutdown dates for the AGRs are between 2014 and 2023, which would mean after 30 to 40 years of lifetime. These dates are not part of the licence, but have been determined by the operators according to technical and economical considerations. Due to AGR-specific technical issues (problems with graphite cracking and with steam generators), it seems that contrary to LWRs which are deployed in other countries, a lifetime extension by decades is not possible, or at least not economical.[58] However, EDF, the owner of the AGR fleet, recently announced an extension to the AGRs' lifetimes by on average five years.[59] If, as is the case for four units at Heysham A and Hartlepool, this extension is already covered by the ten-year validity of the existing PSR, there is no specific regulatory procedure for the ONR to endorse the extension at all. For Sizewell B, the only PWR, EDF expects to extend the lifetime to 60 years (until 2055).

On 12 March 2011, the day after the Fukushima accident, the government requested the Chief Inspector of Nuclear Installations to produce a report on the implications of the accident for the UK nuclear industry.

57. The ONR was created on 1 April 2011, succeeding, *inter alia*, to the Nuclear Installations Inspectorate (NII).
58. These technical issues are described in "The United Kingdom's Fourth National Report on Compliance with the Convention on Nuclear Safety Obligations", September 2007, p. 12. The report is available at www.hse.gov.uk/nuclear/cns4.pdf.
59. *Nucleonics Week*, 23 December 2010; *Inside NRC*, 3 January 2011.

United States[60]

US reactor fleet: There are currently 104 units in operation, 69 PWRs and 35 BWRs. They started commercial operation between 1969 and 1996.

Status of licence: The operating licences of the US nuclear reactors are issued for 40 years, according to Section 103 para. (c) of the Atomic Energy Act (AEA). By NRC regulation (10 CFR 54, Code of Federal Regulations), the operating licences may be renewed for 20 years; the application may be filed up to 20 years before expiry of the original licence (that is, 20 years after the original licence has been issued). Legally, there is no limit on having the licence renewed several times.

Continued/long-term operation: The licence renewal follows a very formal procedure as defined in 10 CFR 54. It does not comprise a full re-assessment of the overall safety and the licensing basis of the plant. Instead, the applicant only has to show that the ageing of structures and components is under control ("strictly ageing"). The operator will implement an ageing management process in order to address the extended period of operation. In this context it has to be stressed that the 40-year term in the act was selected on the basis of economic and antitrust considerations, not technical limitations.

Safety requirements during continued/long-term operation: In the United States, there is no obligation as such to continuously enhance safety. Nuclear power plants have to warrant "adequate protection to the health and safety of the public" [Section 182 para. (a) AEA]. This remains valid for the entire operating life. If, of course, findings show that there is deficiency compromising the "adequate protection", the NRC will require backfitting measures. The NRC can also demand additional backfitting measures beyond "adequate protection". However, in this case the very strict justification procedure of the "backfitting rule" 10 CFR 50.109 has to be followed. The NRC must demonstrate that a substantial increase in safety can be achieved and that the costs are proportionate to the benefits

Concerning the assessment of safety and the implementation of measures to enhance safety, contrary to the European countries, the US NRC does not require a PSR. Nor does the licence renewal process give the occasion for a thorough re-assessment, as explained above. Instead, the NRC itself conducts assessment programmes prompted by operation incidents or findings or by research on generic issues. If backfitting issues arise, these will be implemented via bulletins and generic letters directed to the operators or via new rulemaking (always taking into account 10 CFR 50.109). Again, the main aim of these regulatory activities is to ensure that the licensing basis of all plants continuously complies with the "adequate protection" requirement.

Current situation and outlook: Of the 104 operating plants, 61 have so far received a licence renewal from the NRC. For 22 further units, applications have been filed. Applications are expected from another 16 units.[61] The discussion on a second round of licence renewals, leading to lifetimes of 80 years, has started.

60. For a general introduction into the system of US nuclear regulation, giving particular attention to the question of applying new requirements to existing plants, see Raetzke/Micklinghoff, *op. cit.*, pp. 128-151.
61. All statistics as of February 2011; see www.nei.org/resourcesandstats/nuclear_statistics/licenserenewal.

Following the Fukushima accident, US President Barack Obama requested that the NRC undertake a comprehensive safety review of all existing nuclear energy facilities.[62]

The US 3rd Circuit Court of Appeals in Philadelphia asked the NRC on 21 March 2011 to "advise the court what impact, if any, the damages from the earthquake and tsunami at the Fukushima Daiichi Nuclear Power Station may have on the propriety of granting the license renewal application for the Oyster Creek Generating Station". The NRC approved a 20-year licence renewal for Oyster Creek on 8 April 2009 but the renewal remains before the court on a series of challenges brought by associations and individuals.

62. Remarks by the President on America's Energy Security, Georgetown University Washington, D.C., 30 March 2011: www.whitehouse.gov/the-press-office/2011/03/30/remarks-president-americas-energy-security.

Convention on Supplementary Compensation for Nuclear Damage (CSC) and harmonisation of nuclear liability law within the European Union

*by Ben McRae**

Recent events at the Fukushima Daiichi nuclear power plants have demonstrated the importance of having strong and effective nuclear liability regimes in effect at the national and global levels to assure the availability of prompt and equitable compensation for nuclear damage in the event of a nuclear incident. In the aftermath of Chernobyl, the international community came together under the auspices of the International Atomic Energy Agency (IAEA) and the OECD Nuclear Energy Agency (OECD/NEA) to review the nuclear liability principles in the 1963 Vienna Convention[1] and the 1960 Paris Convention,[2] consider enhancements to improve the effectiveness of those principles and develop the basis for establishing a worldwide liability regime to supplement and enhance those principles with a view to increasing the amount of compensation available for nuclear damage.[3] After an extensive and thorough review of the then existing liability regimes and numerous proposals for improvements, the international community adopted the Convention on Supplementary Compensation for Nuclear Damage (CSC)[4] to be the basis for a worldwide liability regime. With the recent ratification of the CSC by the United States, the CSC is poised to come into effect. Now is the time for the international community, and especially those countries that use and promote the use of nuclear power, to act to bring the CSC into effect. Such action will establish a global regime

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1. 1963 Vienna Convention on Civil Liability for Nuclear Damage. In addition to the original version, there is an amended version established by the 1997 Protocol to Amend the Vienna Convention. Where a reference only refers to the original version or the amended version, the terms "1963 Vienna Convention" and "1997 Vienna Convention" are used, respectively. Where a reference refers to both versions, the term "Vienna Convention" is used.
2. 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy. In addition to the original version, there will be an amended version that will be established when the 2004 Protocol to Amend the Paris Convention comes into effect. Where a reference only refers to the original version or the amended version, the terms "1960 Paris Convention" and "2004 Paris Convention" are used, respectively. Where a reference refers to both versions, the term "Paris Convention" is used.
3. Preamble to the Convention on Supplementary Compensation for Nuclear Damage (CSC).
4. "Explanatory Texts for the 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage", IAEA, Vienna 2004, available on the website of the IAEA's Office of Legal Affairs. It provides a detailed discussion and authoritative interpretation of the CSC and its provisions. McRae, B., "The Compensation Convention: Path to a Global Regime for Dealing with Legal Liability and Compensation for Nuclear Damage", *Nuclear Law Bulletin No. 61* (1998/1); Gioia, A., "Maritime Zones and the New Provisions on Jurisdiction in the 1997 Vienna Protocol and in the 1997 Convention on Supplementary Compensation, *Nuclear Law Bulletin No. 63* (1999/1); McRae, B., "The Convention on Supplementary Compensation for Nuclear Damage: Catalyst for a Global Nuclear Liability Regime", *Nuclear Law Bulletin No. 79* (2007/1).

that assures prompt and equitable compensation for nuclear damage by requiring strong and effective national regimes based on the enhanced nuclear liability principles and by providing for an international fund to supplement the amount of compensation available.

This article focuses on the complementary nature of ratification of the CSC by the member states of the European Union, on the harmonisation of nuclear liability laws within the European Union (EU) and on the importance of both actions proceeding in parallel and being completed soon.

A. Background

In the aftermath of Chernobyl, the international community engaged in a comprehensive review of nuclear liability law. This review resulted in three basic conclusions: first, the existing nuclear liability principles continue to be a much more effective means of assuring prompt and equitable compensation for nuclear damage than normal tort law. Specifically, channelling all legal liability to the operator on the basis of strict liability minimises litigation and facilitates the concentration of resources to compensate damage. Second, certain enhancements to the principle were needed. The most important of these enhancements was to expand the definition of nuclear damage and updating the jurisdiction provisions. Third, the amount of compensation for nuclear damage needed to be increased.

To address these conclusions, the existing regimes under the Vienna and Paris Conventions were enhanced and a new convention, i.e. the CSC, was adopted on 12 September 1997 at a Diplomatic Conference in Vienna, Austria. By adopting the CSC, the international community recognised its responsibility to assure prompt and equitable compensation for nuclear damage in the event of a nuclear incident. The CSC is designed to include all countries that have national laws incorporating the enhanced nuclear liability principles and that agree to contribute to an international fund to supplement the amount of compensation for nuclear damage. The CSC focuses on harmonising national nuclear liability regimes in a manner that promotes prompt compensation and on increasing the amount of guaranteed compensation available in the event of a nuclear incident.

A global nuclear liability regime based on worldwide adherence to the CSC is a critical element of the infrastructure necessary for achieving the full benefits of nuclear power with respect to climate change, energy security and economic growth. This global regime will: 1) provide an effective and equitable mechanism by which the international community, and especially those countries that promote the use of nuclear energy, can demonstrate its commitment to responsible action in the event of a nuclear incident; 2) build public confidence in the use of nuclear energy; and 3) provide legal certainty necessary for investors and suppliers to participate in nuclear projects.

Following adoption of the CSC, the EU member states continued to focus on nuclear liability law. This focus has taken two tracks: one track is the effort by those EU member states that belong to the Paris Convention to revise the Paris Convention. This undertaking not only involved incorporating the enhancements developed in connection with the CSC but also revising the Paris Convention and the Brussels Convention[5] to significantly increase the amount of compensation available

5. The 1963 Brussels Convention on Supplementary Compensation, including the amended version that will be established when the 2004 Protocol to Amend the Brussels Convention comes into effect. Where a reference only refers to the original version or the amended version, the terms “1963 Brussels Convention” and “2004 Brussels Convention” are used

under these conventions. In making these revisions, care was taken to maintain the compatibility of the revised conventions with the CSC. Protocols to amend the Paris Convention and the Brussels Convention were adopted in 2004 and efforts are under way to bring those protocols into effect.[6] The second track is the efforts by the EU member states to achieve harmonisation of nuclear liability law within the EU and to address the concerns of those member states that do not subscribe to the nuclear liability principles, in part, because they feel that the amount of compensation available is too low.[7] These efforts have resulted in the development of a comprehensive report on the current status of nuclear law within the EU and potential means for achieving greater harmonisation,[8] a workshop to discuss that report,[9] and formation of a working group of experts to examine the issues related to achieving greater harmonisation.

Achieving greater harmonisation of nuclear liability law in the EU and establishing a global nuclear liability regime are complementary efforts that should proceed together and be completed without delay. This paper does not evaluate the merits of various approaches being considered to achieve greater harmonisation of nuclear liability law within the EU. Rather, it discusses how membership by EU member states in the CSC is compatible with all approaches being considered for achieving greater harmonisation and then sets forth the reasons in support of adherence by EU member states to the CSC and addresses several misconceptions about the CSC.

B. Discussion

The CSC is consistent with harmonisation of nuclear liability law in the EU and can facilitate efforts to achieve greater harmonisation

The Legal Study for the Accession of Euratom to the Paris Convention on Third Party Liability in the Field of Nuclear Energy (legal study) addresses harmonising nuclear liability law in the EU by looking at the areas of 1) insurance, 2) jurisdiction and 3) legal principles. The legal study also makes clear that achieving harmonisation is tied to increasing compensation available for nuclear damage.[10] It examines five options for addressing nuclear liability law within the EU and their

respectively. Where a reference refers to both versions, the term "Brussels Convention" is used.

6. For a discussion of the revision process and the amendments to the Paris Convention and the Brussels Convention, see Dussart Desart, R., "The Reform of the Paris Convention on Third Party Liability in the Field of Nuclear Energy", *Nuclear Law Bulletin No. 75* (2005/1).
7. For a discussion of the concerns of the EU member states that do not subscribe to the nuclear liability principles, see Hinteregger, M., "The New Austrian Act on Third Party Liability for Nuclear Damage", *Nuclear Law Bulletin No. 62* (1998/2) and O'Higgins, P. and McGrath, P., "Third Party Liability in the Field of Nuclear Law: An Irish Perspective", *Nuclear Law Bulletin No. 70* (2002/2).
8. Legal Study for the Accession of Euratom to the Paris Convention on Third Party Liability in the Field of Nuclear Energy (legal study), Final Report: TREN/CC/01-2005, 2009, available at: mng.org.uk/gh/private/2009_12_ accession_euratom.pdf.
9. "Prospects of a Civil Nuclear Liability Regime in the Framework of the EU". The workshop was jointly organised by the European Commission and the Brussels Nuclear Law Association and held in Brussels, Belgium on 17-18 June 2010. This article is based, in part, on a presentation, "Convention on Supplementary Compensation for Nuclear Damage (CSC): Mechanism for Achieving Complementary Objectives of Harmonisation of Nuclear Liability Law within European Union and Establishment of Global Nuclear Liability Regime", by the author at the workshop.
10. See Legal Study, *op. cit.*, pp. 88, 102-105; see also Hinteregger, M., *ibid.*, p. 28 and O'Higgins, P. and McGrath, P., *ibid.*, p. 21.

potential for achieving greater harmonisation. These options are: a) non-action; b) all 27 EU member countries are/become parties to the Paris Convention; c) 22 EU member states are/become parties to the Paris Convention with an opt-out for the 5 non-convention member states; d) Euratom accession to the Paris Convention; and e) a Euratom Directive on nuclear third party liability. The CSC is consistent with all five options and will facilitate achieving harmonisation.

Insurance

There is no provision on insurance or other financial security in the main body of the CSC. A contracting party to the CSC must follow the applicable provision in the Paris Convention,[11] the Vienna Convention[12] or the Annex,[13] all of which provide substantial discretion in setting the amount, type and terms of insurance and other financial security. Thus, the CSC would not interfere with taking action to specify the amount and type of insurance or other financial security for nuclear damage that an operator in an EU member state must have. Moreover, there is nothing in the CSC that would interfere with requiring operators in the EU to participate in alternative forms of financial security such as pooling arrangements.[14]

Jurisdiction

Article XIII of the CSC sets forth the jurisdictional rules that all states party to the CSC must follow. In general, these rules grant exclusive jurisdiction over a nuclear incident to the CSC state in whose territory, territorial sea or exclusive economic zone (EEZ) the incident takes place. Article XIII enhances the jurisdiction provisions in the 1960 Paris Convention and the 1963 Vienna Convention by recognising recent developments in the Law of the Sea and the concerns of coastal states over maritime shipments of nuclear material. Specifically, it expands the jurisdiction provisions in those conventions by providing the courts of a CSC state with exclusive jurisdiction over claims for nuclear damage resulting from a nuclear incident in its EEZ. This enhanced jurisdictional provision has broad support in the international community, especially among countries with concerns about potential maritime accidents involving nuclear material and has been incorporated into both the 1997 Vienna Convention and the 2004 Paris Convention. Thus, if all EU member states belonged to the CSC, the CSC would harmonise the jurisdictional rules for a nuclear incident in the EU in a manner consistent with current views on jurisdiction over a nuclear incident.

11. Article X of the 2004 Paris Convention provides that "[t]o cover the liability under this Convention, the operator shall be required to have and maintain insurance or other financial security of the amount established pursuant to Article 7(*a*) or 7(*b*) or Article 21(*c*) and of such type and terms as the competent public authority shall specify.
12 Article VII of the Vienna Convention provides that "[t]he operator shall be required to maintain insurance or other financial security covering his liability for nuclear damage in such amount, of such type and in such terms as the Installation State shall specify".
13. Article 5 of the Annex to the CSC provides that "[t]he operator shall be required to have and maintain insurance or other financial security covering his liability for nuclear damage in such amount, of such type and in such terms as the Installation State shall specify".
14. Although beyond the scope of this article, pooling is a very effective means of implementing the "polluter pays principle" and increasing the amount of compensation available for nuclear damage. See Legal Study, pp. 85-88; see also Carroll, S., "Perspective on the Pros and Cons of a Pooling-type Approach to Nuclear Third Party Liability", *Nuclear Law Bulletin No. 81* (2008/1) and Pelzer, N., "International Pooling of Operators' Funds: An Option to Increase the Amount of Financial Security to Cover Nuclear Liability?", *Nuclear Law Bulletin No. 79* (2007/1).

Article XIII also sets forth the rules on enforcement of judgments. Specifically, it provides that a judgment by a court of the CSC state with exclusive jurisdiction over a nuclear incident is enforceable in the courts of another CSC state as if the judgment were a judgment by a court of that country. Reconsideration of the merits of the case is never permitted. Thus, if all EU member states belonged to the CSC, it would provide assurance that a judgment by a court of the EU member state with jurisdiction under the CSC would be enforced in the courts of all other CSC states.

Legal principles

The CSC requires its contracting parties to have national law on nuclear liability that is based on the Paris Convention, the Vienna Convention or the Annex to the CSC[15] and that incorporates the provisions in the CSC on jurisdiction, compensation and the definition of nuclear damage. The Paris Convention, the Vienna Convention and the Annex to the CSC provide for national law based on the same legal principles,[16] including: 1) channelling all legal liability for nuclear damage exclusively to the operator; 2) imposing liability on the operator without the need to demonstrate fault, negligence or intent and 3) compensating damage without any discrimination based upon nationality, domicile or residence. These principles represent a legal approach that focuses on compensating damage promptly with a minimum of litigation. Incorporation of these principles into national law eliminates the need to prove who is responsible for causing a nuclear incident, whether there is fault, negligence or intent, or whether there are any legal defences that might be raised. The only issues to be resolved are whether the nuclear incident caused the damage and, if so, what is the amount of the damage. Accordingly, claims should be paid promptly with little or no litigation. Thus, if all EU member states belonged to the CSC, the national laws of EU member states would be harmonised in a manner that promotes prompt compensation with minimal litigation.

C. Compensation

The CSC requires two tiers of compensation: the first tier comes from the requirement in Article III(1)(a)(i) that "the installation state[17] shall ensure the availability of SDR 300 million[18] or a greater amount that may have been specified to the Depository". To the extent funds from the liable operator are insufficient to cover the amount of the first tier, the CSC requires the installation state to make public funds available to cover the difference. In the event unlimited liability is imposed on the liable operator, the obligation of the installation state to make public funds available is limited to the first tier amount. The second tier comes from the

15. Article II.1 of the CSC.
16. See McRae, B., *op. cit.*, *Nuclear Law Bulletin No. 61*, pp. 34-38. The footnotes to the text on the Annex provisions provide a crosswalk to the corresponding provisions of the 1963 Vienna Convention, the revised Vienna Convention, the 1960 Paris Convention and the Annex provisions. See also Explanatory Texts, Section 3.3.2.
17. Installation state refers to the contracting party in which the nuclear installation operated by the liable operator is located. The CSC, the Paris Convention and the Vienna Convention assign certain functions to the installation state or its national law regardless of where a nuclear incident occurs or whether the courts of the installation state have jurisdiction over the nuclear incident. This article uses installation state in place of contracting party to denote functions that are always assigned to the installation state or its national law. See e.g., Explanatory Texts, Sections 1.2, 1.4 and 2.8.
18. SDRs (Special Drawing Rights) are reserve assets defined and maintained by the International Monetary Fund. The value of the SDR is defined by a weighted currency basket of four major currencies: the Euro, the US dollar, the British pound, and the Japanese yen. As of 22 June 2011, SDR 1 equals USD 1.6 or EUR 1.11.

requirement in Article III(1)(b) that contracting parties "shall make available public funds" to an international fund to supplement the first tier amount. The second tier amount is dependent on the number of nuclear power plants in contracting parties and will increase as the number of such plants increase. If most countries with nuclear power plants adhered to the CSC today, the amount of the second tier would be more than SDR 300 million.[19]

The CSC also permits a contracting party to establish a third tier of compensation in excess of the first two tiers, however,[20] the CSC does not govern the distribution of this third tier.

Thus, if all EU member states belonged to the CSC, it would ensure the availability of at least SDR 300 million to compensate nuclear damage, plus the amount of the second tier of international fund. The EU member states, however, would have the option of taking action to establish a minimum first tier amount for EU member states greater than SDR 300 million. For example, the EU member states could decide that the minimum first tier amount for EU member states should be EUR 700 million,[21] which would be based on the amount of the insurance that an operator could reasonably be expected to obtain in the current market. Or the EU could decide that the minimum first tier amount for EU member states should be EUR 1 200 million[22] or a higher amount, which would be based on requiring the installation state or operators to fund the part of the first tier amount in excess of the amount of insurance available.

The CSC recognises that, while the international community can set a floor on the amount of first tier compensation that is acceptable to trigger contributions to the CSC international fund, the ultimate decision on what the first tier amount should be for a particular country or region is a political decision that will reflect circumstances in that country or region. The option to set a first tier amount higher than SDR 300 million permits the development of a political consensus on how much damage can and should be addressed through the civil legal liability system. Acceptance of the basic principles of nuclear liability law, especially by countries that have no nuclear power plants, is dependent on their linkage to an effective mechanism to assure a meaningful amount of compensation. Prompt compensation with a minimum of litigation is attractive only if there is a substantial amount of compensation available. Thus, the amount of assured compensation available for a nuclear incident in the EU most likely will be the major factor in whether efforts to harmonise nuclear liability law among EU member states will be successful. The CSC will not hinder achieving consensus among EU member states and, in fact, will assist this process by making supplementary funds available through the CSC international fund, of which a substantial portion will come from non-EU countries.[23]

19. Assuming the EU member states, Canada, China, India, Japan, the Republic of Korea and the United States belonged to the CSC, the international fund would provide approximately SDR 329 million. This amount is based on the IAEA online calculator that can be found at the website http://ola.iaea.org/CSCND/Calculate.asp.
20. Article XII(2) of the CSC provides that damage in CSC states with no nuclear installations on their territory may not be excluded from third tier compensation on any grounds of lack of reciprocity.
21. That is the same as the first tier amount for a country that belongs to the 2004 Paris Convention.
22. That is the same as the second tier amount for a country that belongs to the 2004 Brussels Convention.
23. Assuming the EU member states, Canada, China, India, Japan, the Republic of Korea and the United States belonged to the CSC, the international fund would provide approximately SDR 329 million. Approximately 198 million of this amount would come from non-EU Countries, including approximately SDR 101 million from the United States.

The CSC will fit over whatever approach is followed to harmonise nuclear liability law among EU member states

Umbrella instrument

The CSC was developed to be a free-standing instrument that would fit like an umbrella over the national laws of countries that are contracting parties of the Paris Convention or the Vienna Convention or that have national law consistent with the basic nuclear liability principles as set forth in the Annex to the CSC. As a result, an EU member state that belonged to the Paris Convention or the Vienna Convention would have to change its national law only to the extent necessary to reflect the enhancements in the CSC that apply to all CSC states. These enhancements include 1) ensuring the availability of at least SDR 300 million to compensate nuclear damage, 2) agreeing to contribute to an international fund established by the CSC, 3) implementing the enhanced definition of nuclear damage in the CSC, 4) implementing the enhanced jurisdictional provisions in the CSC and 5) extending coverage to include all CSC states. None of these actions would be inconsistent with the Paris Convention or the Vienna Convention. An EU member state that did not belong to the Paris Convention or the Vienna Convention would have to take similar actions, as well as ensure its national law was consistent with the basic principles of nuclear liability law set forth in the Annex.

The CSC recognises that the need to adopt national law might be a disincentive to some countries, especially a country that has no nuclear industry and thus has no need for a nuclear liability regime, except as a contingency in the event of a transportation accident in its territory, territorial sea or EEZ. Accordingly, the CSC is clear that contracting parties to the CSC need not enact implementing legislation to the extent its national legal framework makes treaty provisions directly applicable without the need for legislation. The CSC also is clear that its contracting parties with no nuclear installations on its territory need only implement those provisions of the CSC necessary to give effect to its obligations under the CSC.[24]

Implementation of CSC by EU member states

Given the umbrella aspects of the CSC, EU member states could adhere to the CSC with little or no change in their national laws, regardless of what approach is followed to harmonise nuclear liability law among EU member states. Assuming no change in the *status quo*, the following actions might be necessary: each EU member state would need to have national law that incorporated jurisdictional provisions and definition of nuclear damage in the CSC; each EU member state with a nuclear installation would need to have national law that ensured the availability of a first tier amount of at least SDR 300 million and that covered nuclear damage in all CSC states; each EU member state that was not member of the Paris Convention or the Vienna Convention would need to take action to ensure its court would apply the principles of nuclear liability law as set forth in the Annex if its courts had jurisdiction over a nuclear incident. On the other hand, if all EU member states were parties to the 2004 Paris Convention, there would be no need for any change. The 2004 Paris Convention contains the same jurisdictional provisions and essentially the same definition of nuclear damage as the CSC. In addition, the scope provision in the 2004 Paris Convention would encompass other CSC states. Furthermore, the 2004 Paris Convention establishes a first tier amount of at least EUR 700 million.[25]

24. Chapeau of Annex to CSC; see Explanatory Text, Sections 1.2 and 3.4.
25. With respect to EU member states that are contracting parties to both the 2004 Paris Convention and the 2004 Brussels Convention, the first tier amount most likely would be EUR 1 200 million since Article 14(d) of the 2004 Brussels Convention appears to

Operation of the CSC

In the event of a nuclear incident in an EU member state, the CSC would operate as follows: the first tier amount would be used to compensate nuclear damage in EU member states and other contracting parties to the CSC.[26] If nuclear damage exceeds the first tier amount, the EU member states and other CSC states would contribute to the CSC international fund in accordance with the provisions of Article IV of the CSC.[27] The second tier amount from the CSC international fund would be used to compensate nuclear damage in EU member states and other CSC states, bearing in mind that according to Article XI(1)(b) of the CSC, 50% of the second tier funds shall be available to compensate claims for nuclear damage suffered outside the territory of the installation state.[28] The CSC does not govern the compensation of nuclear damage beyond the first and second tier amounts.[29] Thus, EU member states would be free to establish additional means (such as the Brussels Convention) to compensate nuclear damage within the EU beyond the first and second tier amounts.

The CSC provides the only basis for a global nuclear liability regime

Potential to include countries with most of the nuclear power plants worldwide

As noted previously, the CSC is an umbrella instrument that requires minimal changes in the national law of countries that are parties to the Paris Convention or the Vienna Convention or that have national law consistent with the basic nuclear liability principles as set forth in the Annex to the CSC. In addition, the CSC is a free-standing instrument that does not require a country to be a party to the Paris Convention or the Vienna Convention. This free-standing aspect is especially important for countries that have thus far chosen not to join the Paris Convention or the Vienna Convention.[30] These attributes make the CSC the only international instrument with a realistic possibility of establishing a global regime.[31]

contemplate that contributions to the CSC international fund by a 2004 Brussels state would take place after compensation had been made available in accordance with Article 3(b)(i) and (ii) of the 2004 Brussels Convention.

26. The first tier amount is available to compensate nuclear damage wherever suffered unless the installation state exercises the discretion under the CSC to make first tier funds unavailable to compensate nuclear damage in non-CSC states.
27. Article 14(d) of the 2004 Brussels Convention provides that where all the 2004 Brussels states belong to the CSC, a 2004 Brussels state may use the funds that it would otherwise contribute to the Brussels supplementary fund to satisfy its obligation under the CSC to contribute to the CSC international fund. This provision addresses possible concerns by a Brussels state that the CSC might require the state to contribute public funds to an international supplementary fund twice (i.e. once to the CSC international fund and once to the Brussels supplementary fund).
28. The reservation of 50% of the second tier for transboundary damage (i.e. damage outside the installation state) in EU member states and other CSC states only applies if the first tier amount is less than SDR 600 million. Thus, the reservation would not apply if the first tier amount is comparable to the amount required by the 2004 Paris Convention.
29. As noted previously, Article XII(2) of the CSC provides that damage in CSC states with no nuclear installations on their territory may not be excluded from third tier compensation on any grounds of lack of reciprocity.
30. This group includes many countries with a number of nuclear power plants (such as Canada, China, India, Japan, the Republic of Korea and the United States), as well as most countries with no nuclear power plants.
31. Pelzer, N., "Learning the Hard Way: Did the Lessons Taught by the Chernobyl Nuclear Accident Contribute to Improving Nuclear Law", *International Nuclear Law in the Post-Chernobyl Period*, OECD, Paris, 2006, pp. 73-115. In a thoughtful discussion about the future of nuclear liability, including the prospects for a global nuclear liability regime,

Inclusion of the EU member states in the CSC will bring the CSC into effect as a global regime. With the EU member states as parties to the CSC, CSC states will be located around the globe on four continents and possess over 250 reactors (over 57% of the reactors in the world).[32] With the inclusion of the other countries currently considering the CSC,[33] CSC states will be located on five continents, possess over 370 reactors (over 84% of the reactors in the world), and include the countries where the greatest growth in the use of nuclear power is anticipated.[34]

United States and the CSC

The CSC is the only international nuclear liability instrument to which the United States can belong. The United States helped develop and then ratified the CSC because it sees great merit in belonging to a global nuclear liability regime but cannot join the Paris Convention or the Vienna Convention. This inability to join the Paris Convention or the Vienna Convention results from the nature of the nuclear liability regime in the United States. The Price-Anderson Act[35] was adopted by the United States in 1957 as the world's first national law for dealing with nuclear liability and thus predates both the Paris Convention and the Vienna Convention. It pioneered the concept of channelling liability for nuclear damage exclusively to the operator but did so on the basis of economic channelling rather than legal channelling.[36] It has served for over 60 years as a lynchpin for the development of the world's largest fleet of commercial nuclear power plants and it would be impractical for the United States to revise this law to replace economic channelling with legal channelling.

The drafters of the CSC recognised that a nuclear regime could not be truly global if it did not include the country that has the most nuclear power plants in the world. The drafters also recognised that the Price-Anderson Act ensures that, in the event of a nuclear incident with substantial off-site damage, victims will receive prompt compensation for nuclear damage up to approximately USD 13 billion from a fund provided by operators and guaranteed by the United States government. This compensation would be provided on the basis of strict liability and with minimal

Pelzer notes that CSC "marks major progress in developing a universally harmonised nuclear law", that the CSC's "main advantage is its free-standing character" and that the CSC "is thus apt to provide the basis for a global regime", p. 111.

32. European Nuclear Society, "Nuclear Power Plants, World-Wide" (NPP World-Wide) at www.euronuclear.org/info/encyclopedia/n/nuclear-power-plant-world-wide.htm.
33. The countries currently considering the CSC include Canada, China, India, Japan, the Republic of Korea and the United Arab Emirates.
34. European Nuclear Society, *op. cit.* (Footnote 32).
35. 42 USC § 2210. The Price-Anderson Act operates as follows: owners of nuclear power plants pay a premium each year for USD 375 million in private insurance for off-site liability coverage for each reactor unit. This first tier of insurance is supplemented by a second tier of operator funds from a retrospective pool. In the event a nuclear accident causes damages in excess of USD 375 million, each owner of a nuclear power plant would be assessed a prorated share of the excess up to USD 111.9 million per reactor unit. With 104 reactors currently licensed to operate, this secondary tier of funds would yield about USD 12.6 billion. If 15% of these funds are expended, prioritisation of the remaining amount would be left to a federal district court. If the second tier is depleted, Congress must determine whether additional relief is required.
36. Economic channelling and legal channelling both make the operator exclusively liable for the nuclear damage resulting from a nuclear incident. Economic channelling accomplishes this objective by making the operator fund an indemnification system that indemnifies anyone who incurs legal liability for a nuclear incident. In other words, the operator pays for all the nuclear damage for which there is legal liability.

litigation.[37] Accordingly, Article 2 of the Annex to the CSC permits the United States to belong to the CSC without replacing economic channelling with legal channelling as long as it maintains its existing nuclear liability regime.

Broad adherence

Many countries, and especially countries without nuclear power plants, have been unwilling to join the Paris Convention or the Vienna Convention because they perceive these conventions as not focusing sufficiently on the concerns of those who might suffer nuclear damage in the event of a nuclear incident. The CSC maintains the basic principles of nuclear liability law set forth in the Paris Convention and the Vienna Convention, while including provisions to address the concerns of countries that have not joined these conventions. Specifically, the CSC grants a contracting party exclusive jurisdiction over a nuclear incident in its territorial sea or its EEZ, provides for an expansive definition of nuclear damage and ensures the availability of a meaningful amount of compensation.[38] This more balanced approach is fundamental to attracting the broad adherence necessary for a global regime.

Joint Protocol

The Joint Protocol[39] cannot provide a basis for a global regime. Since opening for signature in 1988, the Joint Protocol has attracted 26 countries as contracting parties. These countries are located mostly in Europe and possess 66 reactors (approximately 15% of the reactors in the world).[40] Although the Joint Protocol has played an important role as a regional arrangement linking certain European countries, it has failed to attract sufficient adherence to become a global regime. There are several reasons why the Joint Protocol has not and cannot provide the basis for a global regime.

As an initial matter, unlike the CSC, the Joint Protocol is not a free-standing instrument. In order to belong to the Joint Protocol, a country must also belong to either the Paris Convention or the Vienna Convention. Thus, since the United States cannot join the Paris Convention or the Vienna Convention, the Joint Protocol cannot include the United States that possesses approximately 24% of the commercial nuclear power plants in the world.[41] This inability to include the leading nuclear power is a decisive drawback to establishing a global regime.[42]

37. For comparison, USD 13 billion is approximately six times more than the amount that would be available under the combined 2004 Paris Convention/2004 Brussels Convention system, i.e. EUR 1.5 billion. However, compensation under the latter system does not include legal costs (interest, claims handling costs) which would have to be paid in addition to the compensation amount and must not be paid out of the available compensation amount.
38. McRae, B., *op. cit.*, *Nuclear Law Bulletin No. 61* (1998/1), pp. 26-28.
39. The 1988 Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention (Joint Protocol).
40. For comparison, countries that belong to the 1997 Vienna Convention possess 4 reactors (less than 1% of the reactors in the world), countries that belong to the Vienna Convention possess 72 reactors (approximately 13% of the reactors in the world), countries that belong to the CSC possess 108 reactors (approximately 24% of the reactors in the world), countries that belong to the Paris Convention possess 125 reactors (approximately 29% of the reactors in the world), and countries that do not belong to any convention possess 137 reactors (approximately 31% of the reactors in the world).
41. The United States has 104 nuclear power plants out of the 440 nuclear power plants in the world.
42. Pelzer, N., *op. cit.* (Footnote 31), p. 113.

In addition, the Joint Protocol has several aspects that make it unattractive to many countries. First, the Joint Protocol links a country to all other countries that belong to the Joint Protocol and to any version of the Paris Convention or the Vienna Convention. Thus, by adhering to the Joint Protocol, a country would have to accept linkage with countries that belong to the Joint Protocol and to the 1963 Vienna Convention that permits a limit on the liability of an operator as low as USD 5 million and that does not contain the enhanced jurisdictional provisions or the enhanced definition of nuclear damage.[43] The drafters of the 1997 Vienna Convention recognised that some countries might find it unacceptable to join an international instrument if such action resulted in the possibility of exclusive jurisdiction over a nuclear incident residing with the courts of a country whose national law reflected the minimal requirements of the 1963 Vienna Convention. Accordingly, the 1997 Vienna Convention contains a provision that gives countries the option of belonging to the 1997 Vienna Convention without having treaty relations with countries that only belong to the 1963 Vienna Convention and thus are not obligated to adopt the enhancements in the 1997 Vienna Convention.[44] Membership in the Joint Protocol forecloses that option because the Joint Protocol automatically links a country with all other countries that belong to the Joint Protocol and any version of the Paris Convention or the Vienna Convention and contains no mechanism to opt out of this linkage.[45]

Second, there is uncertainty as to how the Joint Protocol would operate in certain situations. Specifically, it is unclear in certain transportation scenarios which country would have jurisdiction. This uncertainty arises because, unlike the CSC, the Joint Protocol does not contain substantive provisions on jurisdiction that apply to all countries that belong to the Joint Protocol but rather relies on the jurisdictional provisions in the applicable convention. The uncertainty is illustrated by the following example. Assume that countries A and B are non-EU member states that belong to the Vienna Convention and the Joint Protocol, that country C is an EU member state that belongs to the Paris Convention and the Joint Protocol, and that a nuclear incident occurs in country C during transport of nuclear material from country A to country B. Under the Joint Protocol, the applicable convention would be the Vienna Convention since the installation state belongs to the Vienna

43. This problem does not arise with respect to the CSC because the CSC contains substantive provisions on first and second tier compensation, the definition of nuclear damage and jurisdiction that must be followed by all CSC states. The Joint Protocol does not contain substantive provisions. Rather, it identifies which convention applies to a nuclear incident and provides that parties to the Joint Protocol that are not parties to the applicable convention should be treated as if they were parties to the applicable convention.
44. Article 19 of the 1997 Vienna Convention.
45. If all the EU countries belonged to the 2004 Paris Convention or to either the 2004 Paris Convention or the 1997 Vienna Convention, their membership in the Joint Protocol would give rise to the possibility of their linkage to a non-EU country that belonged to the 1963 Vienna Convention and the Joint Protocol and that imposed an extremely low liability limit on its operators. For example, assume that all EU member states belong to the Joint Protocol, that a nuclear incident occurs in a non-EU member state and causes substantial nuclear damage in EU member states, and that the non-EU state belongs to the 1963 Vienna Convention and the Joint Protocol and imposes a liability limit of USD 5 million on operators located within its territory. In this scenario, the courts of the non-EU country would have exclusive jurisdiction over claims for nuclear damage in the non-EU country, as well as claims for nuclear damage in EU countries, the amount of funds available to compensate these claims would be limited to USD 5 million and there would be no international fund to supplement the compensation available. No claims could be brought in the courts of any EU country and the Brussels Convention would not apply.

Convention.[46] Most commentators on the Joint Protocol take the view that, since country C is treated as if it were a contracting party to the Vienna Convention, it would have exclusive jurisdiction over the incident.[47] Some commentators, however, take the view that, since country C is not a contracting party to the Vienna Convention, it cannot have jurisdiction under the Vienna Convention and thus country A has exclusive jurisdiction.[48]

Third, unlike the CSC, the Joint Protocol does not provide for supplementary funding for nuclear damage.

The CSC represents a commitment of the international community to ensure the existence of effective nuclear liability regimes at the national and global levels

Effective national nuclear liability regime

As discussed previously, each contracting party to the CSC must have national law based on the nuclear liability principles, adopt the enhanced jurisdictional principles and the enhanced definition of nuclear damage, and ensure the availability of at least SDR 300 million for compensating nuclear damage.

International fund

The international fund established by the CSC is the mechanism at the global level by which the members of the international community, and especially countries that operate nuclear power plants, can demonstrate their commitment to responsible action in the event of a nuclear incident.[49] The international fund is open ended and the amount of compensation available from the fund will grow as the number of nuclear power plants in contracting parties increase. Most of the contributions to the international fund will come from countries that have nuclear power plants. Specifically, 90% of the contributions to the international fund will be based on the installed nuclear capacity in a contracting state and thus will come from only those states where reactors are located. The remaining 10% of the contributions will be based on the UN rate of assessments of contracting parties. Given that many countries with nuclear power plants have a large UN rate of assessment, it is likely that most of the contributions to the international fund will come from countries with nuclear power plants. Countries with no nuclear power plants will provide no more than 2 or 3% of the contributions to the international fund. While only a small percentage of the total contributions to the international

46. Article III.3 of the Joint Protocol provides that, with respect to a nuclear incident during transportation, the applicable convention shall be the convention to which the installation state belongs.
47. See von Busekist, O., "A Bridge Between Two Conventions on Civil Liability for Nuclear Damage: the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention", *Nuclear Law Bulletin No. 43* (1989/1).
48. See "Indemnification of Damage in the Event of a Nuclear Accident. Workshop Proceedings", pp. 85-114; see especially OECD/NEA Secretariat, "Issues Concerning the Interpretation of the Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention", pp. 101-103, and Pelzer, N., "Interpretation of the Joint Protocol in Transport Cases – The German Position", pp. 105-107. The workshop was organised by the OECD/NEA and held at Bratislava, Slovak Republic on 18-20 May 2005.
49. Some have observed that "particular nuclear states do not feel attracted to join" the CSC because of the international fund and thus that the "'supplementary funding element' is a weakness in the design of the CSC". Pelzer, N., *op. cit.* (Footnote 31), p. 114. While the inclusion of the international fund may make ratification of the CSC more difficult for a few countries, the inclusion of an international fund is essential to achieving a global regime that attracts broad adherence from both countries with nuclear power plants and countries with no nuclear power plants.

fund will come from countries with no nuclear power plants, this contribution represents a very important element of international solidarity.

Focus on transboundary damage

The international fund recognises the importance of compensating transboundary damage in a meaningful and equitable manner. The international fund addresses transboundary damage in an equitable manner by reserving half of the fund for transboundary damage if the installation state has established a first tier amount less than SDR 600 million. This provision recognises the importance the international community attaches to compensating transboundary damage and will encourage countries with no nuclear power plants to join the CSC. The provision also will provide an incentive to countries with nuclear power plants to establish first tier amounts of at least SDR 600 million. In addition, this provision applies the "polluter pays principle" to make the installation state more responsible for ensuring compensation for transboundary damage. Moreover, given that most damage is likely to occur in the immediate vicinity of the nuclear power plant where a nuclear incident occurs and thus in the installation state, reserving half the international fund for transboundary damage will help ensure the availability of a meaningful amount of compensation for transboundary damage.[50]

Some have suggested that reserving half of the international fund for transboundary damage is inequitable to the installation state.[51] The international community, however, has chosen an equitable approach for allocating the public funds provided by CSC parties to the international fund that balances the interests of all countries. First, the installation state will always receive more than it contributes and, in most cases, many times more.[52] In other words, the international community will provide the installation state with funds that can be used to compensate nuclear damage in the installation state in amounts that significantly exceed the contribution from the installation state.[53] Second, each state party to the CSC must contribute to the international fund, even if it has no nuclear installations and thus could never be the installation state. Finally, the reservation only applies if

50. Pelzer, N., *op. cit.* (Footnote 31), pp. 110-111.
51. Dussart Desart, R., *op. cit.* (Footnote 6), p. 31.
52. When a country makes public funds available for a purpose, it is not unusual for the country to put restrictions on the use of those funds. For example, the Brussels Convention restricts the use of public funds contributed to the Brussels supplementary fund to nuclear damage in contracting parties to the Brussels Convention. Given that more than half the contributions to the CSC international fund will always come from CSC states other than the installation state, it is not unusual for the CSC states other than the installation state to, in effect, reserve a portion of their contributions to the CSC international fund to be used exclusively for compensating nuclear damage within their territories and not within the territory of the installation state. The decision to make the installation state pay into the international fund at, in effect, a higher rate than other contracting parties is similar to the recent decision by the Brussels Convention states to revise the contribution formula for the Brussels supplementary fund to put more emphasis on the extent to which a contracting party has nuclear power plants within its territory. Both decisions represent an application of the "polluter pays principle".
53. Assuming the CSC only includes the existing contracting parties plus the EU member states, the international fund would make approximately SDR 187 million available, of which approximately SDR 93 million would be available for nuclear damage in the installation state and other contracting parties. Among EU member states, France would make the largest contribution (approximately SDR 34.7 million) to the international fund. The contributions of other EU member states would be considerably lower. For example, the next five largest contributors would be Germany (approximately SDR 20.8 million), the United Kingdom (approximately SDR 11.2 million), Sweden (approximately SDR 8.5 million), Spain (approximately SDR 7.6 million) and Belgium (approximately SDR 5.6 million).

the installation state establishes a first tier amount less than SDR 600 million. Thus, the reservation would not apply if the installation state had a first tier amount comparable to the amount required by the 2004 Paris Convention.[54]

The CSC will assist in building public confidence in the use of nuclear power by assuring meaningful compensation for nuclear damage promptly with a minimum of litigation

The CSC will build public confidence in the use of nuclear power by requiring contracting parties to have national laws based on nuclear liability principles that assure prompt and equitable compensation and by increasing the amount of compensation available in the event of a nuclear incident. The nuclear liability principles represent a legal approach that focuses on compensating damage promptly with a minimum of litigation. Incorporation of these principles into national law eliminates the need to prove who is responsible for causing a nuclear incident, whether there is fault, negligence or intent, or whether there are any legal defences that might be raised. In addition, the CSC grants exclusive jurisdiction to the courts of the contracting party where a nuclear incident occurs so that all claims will be brought in one forum. To ensure claimants from all countries receive equal and fair treatment, the CSC requires all claims to be considered without any discrimination based on nationality, domicile or residence.

The CSC recognises that prompt compensation with minimum litigation is only attractive to the public if there is an assured and meaningful amount of compensation available for nuclear damage. The CSC increases the amount of compensation available for compensating nuclear damage by requiring the operator to be liable for at least SDR 300 million and by requiring contracting parties to contribute to an international fund to supplement the compensation for nuclear damage. In addition to increasing the amount of compensation, the CSC provides for an expansive definition of nuclear damage.[55]

The CSC provides the legal certainty necessary for utilities, nuclear suppliers and investors to participate in designing, constructing and operating nuclear power plants

The CSC provides legal certainty by requiring contracting parties to adopt national laws based on the nuclear liability principles. Legal certainty is essential for investors, nuclear suppliers and plant operators to engage in nuclear projects. Specifically, many investors and nuclear suppliers will not participate in nuclear projects in the absence of channelling liability exclusively to the operator and granting exclusive jurisdiction to the courts of the country where a nuclear incident occurs.[56]

D. Conclusion

The CSC is an excellent vehicle to achieve greater harmonisation of coverage and treatment of nuclear damage within the EU, while establishing a treaty link between EU member states and non-EU member states worldwide. The EU member states should proceed promptly to achieve greater harmonisation of nuclear law within the EU and to become part of a global nuclear liability regime based on the CSC.

54. If the EU adopted a requirement that all EU member states must have a first tier amount of at least SDR 600 million, the reservation would not apply to any nuclear incident for which an EU member state is the installation state.
55. See McRae, B., *op. cit.* (Footnote 4), *Nuclear Law Bulletin No. 79* (2007/1), pp. 20-21.
56. *Ibid.*, p. 22.

Case law

France

Decision of the Administrative Court in Strasbourg on the permanent shutdown of the Fessenheim nuclear power plant (2011)

On 9 March 2011, the administrative court in Strasbourg confirmed the government's rejection to immediately close the Fessenheim nuclear power plant, the first unit of which started operation on 1 January 1978.

The court rejected the motion of the *Association trinationale de protection nucléaire* (ATPN) filed against the decision of the Minister of Economy, Industry and Employment to refuse the final shutdown of the plant. The group, which brings together associations as well as French, German and Swiss municipalities, had taken legal action in December 2008.

The association claimed, *inter alia*:

- the lack of adjustments by the operator regarding authorised discharges of liquid and gaseous effluents despite the entry into force of new stricter standards (especially in Law on Water of 13 January 1992 and Decree No. 95-540 of 4 May 1995 on the discharge of liquid and gaseous effluents);
- the undervaluation of flooding and seismic risks by the operator; and
- incidents and dysfunctions that have affected its operation.

With regard to the seismic risk, it was argued that the particular method of assessment was challenged by a private consulting firm, the *Bureau Résonance Ingénieurs-Conseils SA*, and also by the Institute for Radiological Protection and Nuclear Safety (IRSN), its Bureau on Seismic Research for the Safety of Nuclear Installations (BERSSIN) and the Nuclear Safety Authority (ASN).

However, the administrative judge, when reviewing these arguments, was bound to take as a basis the special conditions that apply to the final shutdown and dismantling of a nuclear installation.

In accordance with Articles 3 and 34 of Law No. 2006-686 of 13 June 2006 on transparency and safety in the nuclear field ("TSN" Law), a decision to finally shut down an installation must be made by decree of the Council of State, after having heard the opinion of the ASN. Also the adoption of this decision depends on the identification of serious risks to the interests mentioned in Article 28 (security, public health and safety, protection of nature and the environment), risks that the backfitting of the facility or the suspension of its activity would not prevent or adequately limit.

On the merits, although the court recognised that Fessenheim was not in compliance with the requirements of the 1992 Law on Water, it noted that the complainants had not demonstrated the existence of a serious risk posed by the water releases as a result of which there was no justification for the final shutdown of the plant. Regarding level 0 or 1 incidents on the INES scale referred to by the applicants, the court declared that they have "no relevance or no importance in terms of safety" following the position of ASN.

The decision of the court in Strasbourg does, however, not prevent new proceedings depending on the conclusions drawn by the ASN following the ten-year periodic safety review of reactor No. 1 in Fessenheim. As part of this mandatory review, the ASN must soon give its opinion to the government on the continued operation of reactor No. 1 for ten more years, probably bound by technical requirements in case of a favourable opinion.

It is therefore possible that a further appeal is made against this new decision if the new technical requirements imposed on the operator are not considered satisfactory by the applicant association.

United States

Judgment of a US Court of Appeals on public access to sensitive security information and consideration of the environmental impacts of terrorist attacks on nuclear facilities (2011)

This case concerns 1) the public's right to access classified and sensitive security information relied upon by the US Nuclear Regulatory Commission (NRC) in its environmental review; and 2) the sufficiency of the NRC's environmental review of the impacts of terrorist attacks for a proposed Independent Spent Fuel Storage Installation (ISFSI). In 2003, the NRC ruled that the National Environmental Policy Act (NEPA)[1] did not require the NRC to consider the impacts of terrorist attacks in its environmental review for the proposed ISFSI at the Diablo Canyon Power Plant.[2] NEPA mandates that all federal agencies must prepare a detailed statement on the environment impacts before undertaking a major federal action that significantly affects the human environment.[3] In 2004, the San Luis Obispo Mothers for Peace, a group of individuals who live near the Diablo Canyon Power Plant, filed a petition in the US Court of Appeals for the Ninth Circuit challenging the NRC's 2003 decision. The Ninth Circuit held that the NRC's environmental review did not comply with NEPA due to the agency's categorical refusal to consider the environmental impacts of terrorist attacks on the proposed ISFSI.[4] The Ninth Circuit remanded the case for the NRC to fulfil its NEPA obligations.

On remand, the commission directed the NRC staff to prepare a revised environmental assessment (EA) considering the impacts of terrorist attacks on the proposed ISFSI. In late 2007, the NRC staff issued a supplemental EA concluding that the ISFSI would not have a significant effect on the human environment and, therefore, that an environmental impact statement was not required. The supplemental EA described the NRC staff's consideration of the potential radiological impacts from terrorist attacks on ISFSIs. The Supplemental EA relied, in large part, on documents that were exempt from public disclosure under the Freedom of Information Act (FOIA),[5] which is incorporated by reference into NEPA. The FOIA authorises agencies to withhold from public disclosure agency records that fall within the act's enumerated exemptions.[6] Some documents relied upon in the NRC's supplemental EA contained 1) classified national security information, which is protected from disclosure by Exemption 1 of the FOIA, or 2) safeguards information (i.e., information involving security matters at nuclear facilities and

1. 42 U.S.C. §§ 4321-4347 (2006).
2. *Pacific Gas & Electric Co.*, CLI-03-1, 57 NRC 1, 3-5 (2003).
3. 42 U.S.C. § 4332(2)(c).
4. San Luis Obispo Mothers for Peace *v* NRC, 449 F.3d 1016 (9th Cir. 2006).
5. 5 U.S.C. § 552.
6. *Ibid.* § 552(b) (listing the Freedom of Information Act's exemptions).

protected from disclosure by Section 147 of the Atomic Energy Act[7]), which is protected by Exemption 3 of the FOIA. The petitioner in this case requested a closed hearing to access the security studies and data relied upon in the NRC's environmental review and filed contentions challenging the sufficiency of the supplemental EA. The NRC denied the request for a closed hearing and rejected these contentions.

Thereafter, the petitioner filed for review of the NRC's decision in the US Court of Appeals for the Ninth Circuit. The petitioner argued that the NRC violated NEPA, the Atomic Energy Act, and the Administrative Procedure Act[8] by denying the petitioner's requests for a closed adjudicatory hearing to permit access to the classified and sensitive security information underlying the agency's NEPA analysis. The petitioner also challenged the NRC's decision to reject several contentions alleging that the NRC's supplemental EA for the ISFSI was inadequate under NEPA. The Ninth Circuit denied the petition in all aspects.[9]

The Ninth Circuit concluded that NEPA does not require the NRC to disclose sensitive security information underlying its NEPA analysis in a closed hearing. The Ninth Circuit explained that NEPA obligates federal agencies to consider significant environmental impacts of proposed federal actions and to inform the public of their consideration of these impacts in the decision-making process, but does not contain a hearing requirement. The Ninth Circuit also indicated that NEPA's public disclosure requirements are governed by the FOIA.[10] As a result, a federal agency might need to consider certain environmental impacts in its decision-making process, but would not be required to disclose to the public its NEPA documents, in whole or in part, if a FOIA exemption applies. Because the petitioner did not challenge the NRC's application of the FOIA exemptions in this case, the Ninth Circuit assumed that the documents were properly withheld from public disclosure. The Ninth Circuit held that the NRC satisfied its NEPA obligations by considering all relevant information, even though the public and the petitioner were not able to review the documents underlying its NEPA analysis. The court explained that NEPA does not distinguish "the public at large" from participants in an agency proceeding, like the petitioner in this case. Therefore, the Ninth Circuit held that NEPA did not require the NRC to hold a closed hearing to allow the petitioner to review material withheld from disclosure to "the public at large" under the FOIA and the NRC's statutory obligations.

The Ninth Circuit rejected the petitioner's argument that the Atomic Energy Act required a closed hearing and access to documents exempted from public disclosure under the FOIA. Section 189(a) of the Atomic Energy Act grants public hearing rights upon request of any person with an interest that could be affected by a commission licensing proceeding.[11] The Atomic Energy Act does not, however, prescribe the manner in which these hearings are to be run. The Ninth Circuit held that the Atomic Energy Act's general provisions do not override NEPA's specific non-disclosure provisions, and that the Atomic Energy Act alone does not require a closed hearing to allow access to sensitive security information.

Finding that neither NEPA nor the Atomic Energy Act required a closed hearing, the Ninth Circuit explained that the decision to grant a special hearing remains within the commission's discretion, though the exercise of this discretion must comply with the Administrative Procedure Act. The Administrative Procedure Act

7. 42 U.S.C. § 2167.
8. 5 U.S.C. §§ 551-559, 701-706.
9. San Luis Obispo Mothers for Peace *v* NRC, 635 F.3d 1109 (9th Cir. 2011).
10. 5 U.S.C. § 552.
11. 42 U.S.C. § 2239(a)(1)(A).

renders agency action unlawful when it is "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law".[12] The Ninth Circuit found that the NRC reasonably concluded that 1) the FOIA allows the NRC to withhold exempt information from public disclosure; 2) the NRC has a statutory obligation to protect national security information; 3) meaningful hearings on the range of terrorist attack scenarios could not be conducted without substantial disclosure of this information; and 4) the risks inherent in disseminating security-related information outweighed any benefit gained from a hearing. The Ninth Circuit, thus, held that the NRC did not violate the Administrative Procedure Act by declining to grant a closed hearing.

The Ninth Circuit also concluded that the NRC did not abuse its discretion in rejecting the petitioner's contentions challenging the sufficiency of the supplemental EA. The Ninth Circuit found that the NRC made factual determinations as to plausible terrorist attack scenarios and considered their consequences in its environmental analysis. The Ninth Circuit indicated that the NRC's supplemental EA complied with NEPA and that the NRC reasonably concluded that an environmental impact statement was not necessary.

Judgment of a US District Court on an exemption from fire safety regulations (2011)

This case concerns the validity of an exemption that the US Nuclear Regulatory Commission (NRC) issued to a licensee from the NRC's fire safety regulations, which were promulgated in 1980.[13] These regulations, among other things, mandate that barriers intended to protect redundant systems for shutting down reactor units shall be able to withstand fire for at least one hour and for longer if a nuclear power plant does not have fire detectors and an automatic fire suppression system.[14] The final rule that enacted these regulations granted licensees 30 days to apply for an exemption from any aspect of the NRC's fire safety programme.[15] The NRC's fire safety regulations with this exemption provision were upheld in Connecticut Light and Power Co. v NRC, 673 F.2d 525 (D.C. Cir. 1982), which held that the commission had the authority to enact these regulations and that the exemption provision was "critical" to the programme.

This case arose after the NRC discovered in 2005 that a particular type of fire barrier did not conform to the NRC safety requirement that a barrier be capable of withstanding fire for at least one hour. Because Indian Point Energy Centre had the non-conforming fire barrier installed, the plant's licensee requested a revised exemption from this requirement in 2006. The NRC granted the exemption in 2007. The plaintiffs in this case filed a formal objection contesting the exemption and requesting a public hearing, but the NRC rejected the petition. Thereafter, the plaintiffs filed a petition with the US Court of Appeals for the Second Circuit challenging the rejection of their petition. The Second Circuit dismissed the plaintiffs' petition for lack of jurisdiction because the Hobbs Act[16] does not confer appellate jurisdiction over final orders issued in proceedings challenging exemptions.[17] The Second Circuit concluded that the plaintiffs were, in fact, challenging an exemption, not an amendment.

12. 5 U.S.C. § 706(2)(A).
13. Fire Protection Program for Operating Nuclear Power Plants, 45 Fed. Reg. 76,602 (19 November 1980) (codified at 10 CFR § 50.48 & pt. 50 app. R).
14. See 10 CFR pt. 50 app. R.G.2.
15. See 45 Fed. Reg. at 76,611.
16. 28 U.S.C. § 2342(4) (2006).
17. Brodsky *v* NRC, 578 F.3d 175, 180 (2nd Cir. 2009).

The plaintiffs then filed a complaint before the US District Court for the Southern District of New York challenging the validity of the exemption.[18] The plaintiffs argued that the NRC lacked authority to issue exemptions to the fire safety regulations, was required to hold public hearings on exemptions, was obligated to prepare an environmental impact statement for the exemption's issuance, and arbitrarily and capriciously issued the exemption. In March 2011, the district court rejected these arguments and granted summary judgment to the NRC.

The district court held that the NRC has authority to issue exemptions to its regulations, including the fire safety regulations. The Atomic Energy Act gives the NRC the authority to promulgate rules governing the operation of nuclear facilities.[19] The district court concluded that the authority to establish rules must go hand-in-hand with the ability to grant exemptions on a case-by-case basis to those rules. Many federal appellate courts have affirmed the NRC's authority to grant exemptions to its regulations.[20]

The District Court also held that a hearing is not mandatory for challenges to exemptions. The Atomic Energy Act provides hearing rights only when a proceeding concerns the "granting, suspending, revoking, or amending of a [...] licence or construction permit",[21] not the granting of an exemption. The District Court, as did the Second Circuit, deferred to the NRC's reasonable distinction between exemptions and amendments. In addition, the District Court concluded that the Administrative Procedure Act does not mandate a hearing for a contested exemption because the Atomic Energy Act does not require such a hearing.

As to the NRC's environmental review, the District Court found that the NRC reasonably determined that an environmental impact statement was not necessary. The National Environmental Policy Act (NEPA) requires that all federal agencies prepare an environmental assessment or an environmental impact statement before undertaking a major federal action that significantly affects the human environment.[22] The NRC issued an environmental assessment and a finding of no significant impact for the exemption challenged in this case. The District Court concluded that the NRC satisfied its NEPA obligations by taking the requisite "hard look" at the environmental impacts of its decision.

Finally, the District Court held that the NRC's decision to issue the exemption was not arbitrary or capricious. The District Court explained that the fire safety regulations were intended to extend a defence-in-depth concept to fire protection, with three specific objectives: 1) to prevent fires from starting in nuclear power plants; 2) to detect, control and extinguish fires promptly; and 3) to protect structures, systems and components important to safety so that fires will not prevent the safe shutdown of power plants. The District Court found that the NRC examined these three objectives, conducted a detailed evaluation and acted reasonably in issuing the exemption. The District Court declined to substitute its own judgment for the NRC's, extending deference to the NRC's substantive decision on nuclear safety.

18. Brodsky *v* NRC, No. 09 Civ. 10594(LAP), 2011 WL 797497, at *1 (S.D.N.Y. 4 March 2011).
19. 42 U.S.C. § 2201(p).
20. See Brodsky, 2011 WL 797497, at *7 (listing decisions by the US Courts of Appeals for the D.C., First, Second, Fourth, and Ninth Circuits that affirmed the NRC's authority to grant exemptions).
21. 42 U.S.C. § 2239(a).
22. *Ibid.* § 4332(2)(c).

National legislative and regulatory activities

Belgium

Regime of radioactive materials (including physical protection)

Amendment of the Act on classification and security clearances, certifications and security notifications (2011)

On 18 April 2011, Act of 30 March 2011 was published which amends Act of 15 April 1994 on the protection of the public and the environment against radiation and relating to the Federal Agency for Nuclear Control and Act of 11 December 1998 on classification and security clearances, certifications and security notifications.

The amendments are part of a comprehensive system of physical protection, the purpose of which is to increase the level of security in nuclear installations and nuclear transport companies. The new act allows to assure oneself, through security clearance, of the reliability of persons who have access to security areas, nuclear material or related documents. In cases where clearance is not (yet) granted, it establishes compensatory measures.

The rationale is as follows: first it was appropriate to assign a security level (which the Act of 30 March 2011 calls "to classify") to nuclear materials, related documents and to "security areas" (i.e. the most sensitive areas) of nuclear facilities and nuclear transport companies. However, the Act of 11 December 1998, before its amendment by the Act of 30 March 2011, was difficult to apply to the nuclear sector because it did not provide for the issuance of security clearances to individuals who need access to classified nuclear material, related documents and security zones. It was therefore necessary to supplement the Act of 11 December 1998 so that a security clearance could be issued to such persons.

Moreover, there are cases where in order to carry out tasks imposed on operators of a nuclear facility by safety and radiation protection standards as well as technical and economic constraints, a person who must have access to security areas, classified nuclear materials or related documents is either waiting for a security clearance (for example in the case of a new recruit) or is unable to receive such in time (e.g. emergencies, occasional maintenance work, short-term contracts and equivalent research contracts, post doctoral internships). However, the Act of 11 December 1998 before its amendment by the Act of 30 March 2011 provided no exception to the principle that access to classified items may not be authorised for persons other than those with a clearance level equal or higher to the classification level thereof.

In order to bring in line security requirements and the realities on the ground, the need to supplement the 1998 Act by the introduction of compensatory measures authorising a person not entitled to access nuclear material, classified security areas as well as related documents appeared.

The 2011 Act first amends the Act of 15 April 1994 in order to allow for the classification of nuclear material, related documents and security areas. This classification consists of assigning a security level and is to be distinguished from the classification as provided under the Act of 11 December 1998.

The Act of 30 March 2011 provides that access to nuclear material, documents and security areas, requires the possession of a security clearance granted in accordance with the Act of 11 December 1998. Since security clearances are currently unquestionably the best way under Belgian law to assure oneself of the reliability of a person, the classification of nuclear material, security areas of nuclear installations and transport, as well as related documents, means that persons who need access, irrespective of their being personnel of the nuclear facility or transport company, are required to hold such a security clearance.

Therefore the set of compensatory measures consists of a security certificate issued in situations strictly defined by law and on a temporary basis by the Director General of the Federal Agency for Nuclear Control to the person concerned, after a security review, and supplementary protective measures (as, for example, accompanying the persons concerned in the security zones or restricted and conditional access to classified nuclear material or related documents) which the person responsible for the physical protection of the nuclear facility or transport company must implement.

Finally, in two cases where the security clearance may not be required either due to the urgency of the situation or because of lack of information about the person, the act provides for the restrictive possibility to allow access to classified nuclear materials, related classified documents and security areas. These are cases in which:

- Persons who are either Belgian nationals but do not reside in Belgium, or are neither Belgian nationals nor have a permanent address in Belgium and who do not hold security clearance issued by the competent authorities of the country where they usually reside and which is recognised by Belgium, are entitled to have access to security areas, nuclear materials and classified documents relating thereto.

- There is an emergency situation which may or may not give rise to significant consequences notably on public health.

Supplementary protection measures are prescribed in both situations.

Czech Republic

General legislation

Resolution of the government of the Czech Republic on the time schedule of preparatory works for enlarging the nuclear power plant Temelín (2011)[1]

The Czech Republic plans to multiply its nuclear power plants in the future as a result of which a number of legal questions arise. Taking these into consideration, the government of the Czech Republic adopted a resolution on 9 February 2011, which deals with the time schedule of preparatory works for enlarging the Temelín nuclear power plant. It is important to note that first, the resolution analyses the most important problems and challenges of applicable Czech legislation regarding the construction of new nuclear power plants, and secondly, that the resolution is not legally binding. It only sets out obligations *vis-à-vis* the administrative

1. This report was kindly submitted by Jakub Handrlica, Assistant Professor, Department of Administrative Law and Administrative Science, Law Faculty, Charles University in Prague.

authorities in charge of those issues, which will be of particular importance for the processes of "nuclear new build".[2]

According to the resolution, the following aspects of the current regulatory framework need to be analysed:

- *Legal and regulatory framework for the licensing of new nuclear power plants, including its connection to the transmission grid*. Particular problems are currently arising from the legal framework governing the planning and construction procedures which will both take a considerable period of time. Currently, it is estimated that the administrative process towards a final decision for the construction of a new nuclear power plant will take approximately ten years. Measures need to be proposed how to accelerate the processes on one hand and comply with the commitments arising from European and international law on the other hand.[3]

- *Strategic interests of the state in the forthcoming tendering processes*. As a matter of fact, the Czech Republic offers foreign companies very specific conditions for their investment in the nuclear industry. Both the government and the public have been traditionally very supportive in regard to developments in the nuclear sector, and the country offers a high level of knowledge in the field of nuclear technologies. Therefore, one can presume that the Czech Republic will attract further investments of nuclear suppliers and perhaps also foreign companies willing to construct nuclear power plants. In relation to this, the government considers very important to identify how it can enforce its strategic interest in the forthcoming tendering processes.[4]

- *Financial burden of licensing and permitting procedures*. Currently, there are no fees for issuing a licence to operate a new nuclear installation by the State Office for Nuclear Safety, as required by the Act on Peaceful Use of Nuclear Energy of 1997.[5] This is another issue for consideration when enlarging the nuclear power capacity, i.e. the financial burden which arises from such a process for the public administration.

However, the "nuclear renaissance" will not be limited to the increase of the number of nuclear power plants. In addition, discussions are being held on the legal framework for the construction of a deep geological radioactive waste repository.[6] In

2. Ministry of Industry and Trade, Ministry of Environment, Ministry of Regional Development, Ministry of Interior, Ministry of Transport, Ministry of Defence, Ministry of Foreign Affairs, State Office for Nuclear Safety.
3. In particular commitments arising from the Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention).
4. The operator of existing nuclear power plants in the Czech Republic and prospective investor of the new ones is the Czech Power Company CEZ, a.s. It was established by the National Property Fund on 30 April 1992 by transferring, in the course of the privatisation process, a portion of ownership from the previously existing state enterprise, Czech Energy Industry. Rights arising from the current ownership by the state (70% of the stocks are owned by the state), enable the Czech Republic to directly influence the composition of the company's management. However, in the future, the situation might change and the legal framework needs to be prepared to reflect this reality.
5. However, the financial expenses of this licensing process are estimated to reach millions Czech koruny (CZK) and therefore, doubts have been raised, if the applicant should not share these expenses with the public administration.
6. The process of identifying the most appropriate place for a deep geological radioactive waste repository started in the former Czechoslovakia in the late 1980s. In 1993, 27 potential sites had been identified. However, the number was reduced to 6 in the following years. In some of the concerned municipalities, local referenda were held and

particular, the issue of the participation of municipalities in the licensing processes is subject to discussions because the concerned municipalities are basically not satisfied with their legal status under the applicable legal framework.

The authority in charge of authorising the construction of a deep geological radioactive waste repository, the Radioactive Waste Repository Authority, therefore established a group of experts in order to propose new laws for the participation of municipalities. Representatives of the state administration, municipalities from the preselected sites, national and local environmental organisations and associations and representatives of the Academy of Sciences of the Czech Republic take part in this group. The aim is to strengthen the transparency of the selection process of a suitable site for a deep geological repository for spent nuclear fuel and high-level radioactive waste, and to facilitate the active participation of the public and the communities in particular in the decision-making process.

With respect to all issues mentioned above, two proposals for amendments of the current Act on Peaceful Use of Nuclear Energy of 1997 have been prepared by the competent authorities:

- *Draft proposal concerning the introduction of licensing fees:* this draft[7] proposes the introduction of several administrative fees for licensing new nuclear installations by the State Office for Nuclear Safety, as well as for the maintenance of such an installation. Proposed fees are up to CZK 150 million.

- *Draft proposal concerning the financial support for municipalities concerned by the licensing process of a deep geological radioactive waste repository:* the second draft proposal[8] enables financial support for municipalities concerned by geological surveys in the course of the licensing of a deep geological radioactive waste repository. Compensation is to be paid from a special account to be specified by a resolution of the Czech government.

Both proposals went through first reading in the Parliament of the Czech Republic on 29 April 2011.

In the Czech Republic, nuclear power generated electricity constitutes about 30% of the country's electricity supply. There are four units operating at the nuclear power site located in Dukovany (EDU-Elektrárna Dukovany) and two units at the nuclear power site at Temelín (ETE-Elektrárna Temelín). The Temelín nuclear power plant is currently the largest power resource in the Czech Republic, owned and operated by the Czech Power Company (CEZ). Furthermore, two research reactors are operated by the Rez Nuclear Research Institute and another by the Czech Technical University in Prague. The primary unit was of Russian (Soviet) origin, but has been extensively rebuilt; the other two were locally designed.

In addition to the installations mentioned above, there are three radioactive waste repositories in the Czech Republic. As from 1 January 2000, all repositories currently in operation in the Czech Republic (i.e. at Dukovany, Richard near Litomerice and Bratrství in Jáchymov)[9] have been transferred to the ownership of the state and delivered in trust

they rejected the plan to construct a repository there. Therefore, the whole process was stopped from 2004 until 2008. In 2008, a deep geological radioactive waste repository was incorporated in the strategic document "Politics of Regional Development of 2008", however, without any specific locality.

7. Draft prepared by the State Office for Nuclear Safety.
8. Draft prepared by the Ministry of Industry and Trade.
9. The Richard repository near Litomerice is currently used for the disposal of institutional waste. The Dukovany repository is used for waste generated by Czech nuclear power plants and the Bratrství repository for the disposal of waste containing only naturally occurring radionuclides.

to the Radioactive Waste Repository Authority, which is responsible for the safe disposal of all radioactive waste in the Czech Republic.

Concerning future development of nuclear capacities in the Czech Republic, the 2004 State Energy Policy envisaged the construction of two or more large reactors (at Temelín) in order to eventually replace Dukovany sometime after 2020.[10] In July 2008, CEZ announced a plan to build two more reactors at the Temelín site, with a construction start in 2013 and commissioning of the first unit in 2020. In mid-2008, CEZ asked the Ministry of Environment for an environmental assessment for the new units, which it said might take two and a half years.

Finland

Third party liability

Temporary Amendment to the Nuclear Liability Act (2011)

The Finnish Parliament in March 2011 adopted a temporary amendment to the Nuclear Liability Act in order to introduce unlimited liability for nuclear damages. Furthermore, the amendment will include an increase of the financial security limit of the operator to EUR 700 million, to be expressed in Special Drawing Rights (SDR).

According to the temporary amendment to the Nuclear Liability Act, the liability of an operator of a nuclear installation, located in Finland, for damages suffered in Finland caused by one and the same incident is unlimited.

The maximum liability of an operator of a nuclear installation, located in Finland, for nuclear damage suffered outside Finland caused by one and the same nuclear incident shall not exceed SDR 600 million. At the moment the amount is at SDR 175 million.

The amendment will enter into force on 1 January 2012 and once the amendments of 2005 regarding the implementation of the 2004 Protocols to amend the Paris Convention on Third Party Liability in the Field of Nuclear Energy and the Brussels Convention Supplementary to the Paris Convention enter into force, the temporary changes would cease to apply.

Ireland

Transport of radioactive materials

Merchant Shipping Act (2010)

The 2010 Merchant Shipping Act provides the legislative basis to enable Ireland to make provisions in relation to the 1974 International Convention for the Safety of Life at Sea and its protocols.

Part 3, Chapter 3, Sections 34-41 outline the nuclear carriage rules which apply for the safe transport of cargo. The following matters are included in the rules: damage stability, fire safety measures, temperature control of cargo spaces, structural considerations, cargo securing arrangements, electrical power supply, radiological protection, management and training, shipboard emergency plan,

10. Further, the strategic document "Politics of Regional Development of 2008" envisaged construction of a third nuclear power plant in Northern Moravia, at the site of Blahutovice (project "Allegro").

notification of an incident involving ships' cargoes, on-board documentation of cargo, emergency response and medical aid.

Romania

Radiation protection (including nuclear emergency planning)

Emergency Ordinance on the identification, designation and protection of critical infrastructures (2010)

Government Emergency Ordinance No. 98 of 3 November 2010[11] concerns the identification, designation and protection of critical infrastructures. The ordinance sets the legal framework regarding the identification of national and European critical infrastructures and the protection thereof in order to better assure the safety, security and stability of the socio-economic systems and the protection of the population. According to the ordinance, the co-ordination, on a national level, of the activities concerning the identification, designation and protection of the critical infrastructures is performed by the Prime Minister, who appoints a state counsellor in this respect. Annex No. 1 shows the detailed list of sectors and subsectors of the national/European critical infrastructures and the responsible public authorities. Under the responsibility of the Ministry of Economy, Trade and Business Environment, these also include the capacities and installations in the electric power industry, including the nuclear industry.

The ordinance transposes into national legislation Council Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection.

Emergency Ordinance on the control regime of dual-use items (2010)

Emergency Ordinance No. 119 of 23 December 2010 of the Romanian Government on the control regime of dual-use items[12] adopts measures to apply Council Regulation (EC) No. 428/2009 of 5 May 2009 setting up a Community regime for the control of exports, transfer, brokering and transit of dual-use items. Community regulations are directly applicable in all member states of the European Union. The ordinance also implements improvements to the control system for dual-use operations by meeting the standards set by Resolution 1540 of UN Security Council of 28 April 2004 and its subsequent resolutions.

The adoption of this act will allow the extension of control of dual-use operations, in particular on the transit of non-Community dual-use items, whether those products are or may be intended, in whole or in part, for use in the development, production, handling, operation, maintenance, storage, detection, identification and dissemination of weapons of mass destruction and their means of carrying or may be intended, in whole or in part, to a military end-use, and introduces penalties for violation of its provisions.

11. Official Journal of Romania Part I No. 757 of 12 November 2010.
12. Official Journal of Romania Part I No. 892 of 30 December 2010.

Regime of nuclear installations

Amendment to the Act on the safe conduct of nuclear activities (2010)

Act No. 111/1996 on the safe conduct of nuclear activities was amended by Law No. 243 of 7 December 2010.[13] According to the amendment, in case of a failure to comply with the control or in case of a failure to observe nuclear related provisions, the National Commission for Nuclear Activities Control (NCNAC) may require the competent authorities either to proceed to forced execution or to commence an investigation. The commission may ask that action be taken by the representatives of the Romanian General Police Inspectorate and its subordinated units in order to ensure the enforcement of the control mandate.

Nuclear safety norms on design and construction of nuclear power plants and nuclear safety norms on siting of nuclear power plants (2010)

Order No. 334/2010 approved the new nuclear safety norms on siting of nuclear power plants[14] while the new nuclear safety norms on design and construction of nuclear power plants were approved by Order No. 335/2010.[15]

The regulatory requirements on siting, design and construction of nuclear power plants have been revised. The new regulations reflect a technology-neutral approach, hence they are applicable to new reactors independent of the technology employed. The new regulations set general principles on the siting, design and construction of nuclear power plants, quantitative nuclear safety objectives, and also requirements on the safety evaluations that need to be conducted for a wide range of conditions, from normal operation to severe accidents. They also outline the licensing process for the siting and construction stages and the requirements on the safety documentation that needs to be submitted for review to the regulatory body by an applicant for a licence. The following requirements represent the new elements in regulating the siting, design and construction of new nuclear power plants:

- quantitative objectives of nuclear safety for the design of protective safety systems;
- requirements for the systematic approach of identification of project-based events and for establishing design bases of the systems, structures and components of nuclear power plants;
- consideration of severe accidents and their analysis to demonstrate the compliance with the objectives of nuclear safety for design and siting;
- detailed requirements for accident analysis, including requirements on how the nuclear safety analysis must combine deterministic and probabilistic analyses;
- detailed requirements for the content of nuclear safety reports to be prepared and submitted for evaluation by the regulatory authority in the licensing process;
- formulation of safety requirements for nuclear power plant systems;

13. Published in the Official Journal of Romania Part I No. 828 of 10 December 2010.
14. Published in the Official Journal, Part I No. 836 of 14 December 2010.
15. Published in the Official Journal, Part I No. 855 of 21 December 2010.

- requirements for the classification of systems, structures, and components of nuclear power plants according to their importance for ensuring nuclear safety functions.

United Kingdom

Organisation and structure

Establishment of the Office for Nuclear Regulation (2011)

The UK's Health and Safety Executive (HSE) established the Office for Nuclear Regulation (ONR) as a non-statutory body from 1 April 2011, pending planned legislation to establish it as a statutory body. The ONR assumes regulatory functions, previously carried out by the UK Department for Transport and by the HSE's Nuclear Installations Inspectorate (NII), the Office for Civil Nuclear Security (OCNS) and the UK Safeguards Office (UKSO).

The establishment of such a body is a result of discussions in the United Kingdom to create an autonomous organisation as the country's new independent regulator with its own board and legal identity in order to strengthen, focus and improve the organisational framework of nuclear regulation. It is also expected that ONR ensures greater accountability, transparency and efficiency of regulatory processes.

According to its mission statement "ONR seeks to secure the protection of people and society from the hazards of the nuclear industry, by ensuring compliance with relevant legislation and by influencing the nuclear industry to create an excellent health, safety and security culture".[16]

United States

Radioactive waste management

Waste Confidence Decision and Rule Update (2010)

On 23 December 2010, the US Nuclear Regulatory Commission (NRC) published an update to its Waste Confidence Decision[17] and Rule.[18] The decision provides the basis for the rule and includes five generic safety and environmental findings. The rule is a general finding by the NRC that there will not be significant environmental impacts from storing spent fuel for at least 60 years after a nuclear power plant's operating licence expires. The decision does not authorise the licensing or operation of individual nuclear power plants. Each nuclear power plant must receive a separate licence before it is authorised to operate, and each licensing action is subject to a separate environmental review. The 2010 updates to the decision and rule are the subject of an ongoing appeal to the US Court of Appeals for the District of Columbia Circuit by a number of states and public interest groups.[19]

16. Homepage of ONR at www.hse.gov.uk/nuclear/index.htm.
17. Waste Confidence Decision Update, 75 Fed. Reg. 81,037 (23 December 2010).
18. Consideration of Environmental Impacts of Temporary Storage of Spent Fuel after Cessation of Reactor Operation, 75 Fed. Reg. 81,032 (23 December 2010).
19. Four actions have been consolidated in this appeal: New York v NRC, No. 11-1045 (D.C. Cir. filed 17 February 2011); NRDC *v* NRC, No. 11-1051 (D.C. Cir. filed 17 February 2011); Prairie Island Indian Community *v* NRC, No. 11-1057 (D.C. Cir. filed 22 February 2011); Blue Ridge Environmental Defense League *v* NRC, No. 11-1056 (D.C. Cir. filed 28 February 2011).

The Waste Confidence Decision and corresponding rule, first issued in 1984,[20] stem from two federal court cases that establish the NRC's obligations for safely storing and disposing of spent nuclear fuel and other high-level waste under the Atomic Energy Act (AEA)[21] and the National Environmental Policy Act (NEPA).[22] The AEA requires the NRC to establish standards governing the civilian use of nuclear material and facilities. NEPA directs federal agencies to evaluate the environmental impacts of major federal actions, such as the licensing of a nuclear power plant.

The 1984 Waste Confidence Decision responded to these cases and included five findings that evaluated 1) the technical feasibility of a repository, 2) the expected availability of a repository (2007-2009), 3) the safe management of spent nuclear fuel, 4) the safety and environmental impacts of storing spent fuel for 30 years after licensed life, and 5) the availability of sufficient storage capacity. These findings satisfied the decisions in the two aforementioned federal cases and formed the basis for the Waste Confidence Rule's conclusions on the environmental impact of spent fuel storage at each reactor after the end of its licensed life.

In 1990, the NRC amended the Waste Confidence Decision and Rule to change the date for the availability of a repository (2025) and to consider the term of a renewed power reactor licence (then assumed to be 30 years and now issued for 20 years).[23] The 2010 update removed the expected date for the availability of a repository (the commission now believes that a repository will be available "when necessary") and expanded the commission's confidence that spent nuclear fuel can be stored safely and without significant environmental impacts from 30 years after licensed life to 60 years after licensed life. When it approved these revisions, the commission also committed to a longer-term analysis of the storage and disposal of spent nuclear fuel and high-level waste. This longer-term analysis will include a more detailed environmental analysis (i.e. an environmental impact statement).

Response to recent events in Japan (2011)

In light of the impact of the severe earthquake and ensuing tsunami on 11 March 2011, on the Fukushima Daiichi nuclear complex in Japan, the US Nuclear Regulatory Commission (NRC) initiated short-term and long-term reviews of the recent events in Japan. In order to lead the short-term review, the NRC established a senior-level agency task force to examine the NRC's regulatory requirements, programmes and processes. The task force is studying the events at the Fukushima Daiichi site, including external events (e.g. natural phenomena), station blackout, severe accident measures and emergency preparedness in order to identify potential near-term regulatory actions affecting domestic reactors. The task force will brief the commission around 30, 60 and 90 days after commencement of its review. Public commission meetings were scheduled for the commissioners to receive interim reports on the progress of the task force's review. After 90 days (in July 2011), the task force will provide its observations, conclusions and recommendations in a written report, which will be released to the public.

20. Waste Confidence Decision, 49 Fed. Reg. 34,658 (31 August 1984); Requirements for Licensee Actions Regarding the Disposition of Spent Fuel Upon Expiration of Reactor Operating Licenses, 49 Fed. Reg. 34,688 (31 August 1984).
21. 42 U.S.C. §§ 2011-2297h (2006).
22. *Ibid.* §§ 4321-4347 (2006). See, e.g., Minnesota *v* NRC, 602 F.2d 412 (D.C. Cir. 1979); NRDC *v* NRC, 582 F.2d 166 (2nd Cir. 1978).
23. Consideration of Environmental Impacts of Temporary Storage of Spent Fuel after Cessation of Reactor Operation, 55 Fed. Reg. 38,472 (18 September 1990); Waste Confidence Decision Review, 55 Fed. Reg. 38,474 (18 September 1990).

Additionally, the task force will identify topics for review during the long-term effort. The long-term review will assess all technical and policy issues related to the events in Japan, including whether the NRC should pursue permanent changes to its regulations. The NRC anticipates that the long-term review will begin in no later than 90 days or as soon as the NRC has sufficient information from the events in Japan. The results of the long-term review will also be a publicly available final report.

News briefs

European Atomic Energy Community

EU response to the nuclear accident in Japan (2011)

Since the devastating events which struck Japan on 11 March 2011, the European Union has been continuously following developments and is fully mobilised to translate its solidarity into concrete support.

The European Commission ECURIE[1] emergency team in Luxembourg provides permanent updates on the radiological situation in Japan. In addition, the commission receives regular information from the International Atomic Energy Agency (IAEA).

In order to draw lessons from the accident in Japan, triggered by a devastating earthquake and tsunami, a first high-level conference was convened on 15 March 2011 by the EU Commissioner for Energy, Günther Oettinger, gathering together national nuclear safety authorities, operators and vendors of nuclear power plants in the EU. At that conference, broad support for the principle of a European approach to a comprehensive safety and risk assessment of nuclear facilities was expressed. This approach was endorsed by the Extraordinary Energy Council of 21 March 2011.

On 25 March 2011, the European Council concluded that the safety of all EU nuclear plants should be reviewed, on the basis of a comprehensive and transparent risk and safety assessment. The Commission and European Nuclear Safety Regulators Group (ENSREG) subsequently developed the scope and modalities of these tests in a co-ordinated framework with the full involvement of EU member states, making full use of available expertise (e.g. the Western European Nuclear Regulators Association, WENRA). The assessments will be conducted by independent national authorities and through peer review; their outcome and any subsequent measures to be taken will be transparent and shared with the commission, ENSREG and the public. The European Council will evaluate the findings by the end of 2011 on the basis of a report from the commission. In addition, the European Council called for similar assessments to be carried out in neighbouring countries and around the world.

Further, the European Council mandated the commission to review the existing legal and regulatory framework for the safety of nuclear installations by the end of 2011.

14th and 15th plenary meetings of ENSREG (2011)[2]

The 14th and 15th meetings of the European Nuclear Safety Regulators Group (ENSREG) took place on 1 February 2011 and on 12/13 May 2011 respectively.

At the 14th meeting, several documents put forward by the three ENSREG working groups were endorsed, i.e. the text of a memorandum of understanding between ENSREG and the IAEA on the modalities for carrying out international peer-review

1. European Community Urgent Radiological Information Exchange.
2. www.ensreg.eu.

missions in EU member states; ENSREG statement on the commission proposal for a Council Directive on the management of spent fuel and radioactive waste; ENSREG guidance for national regulatory authorities on principles for openness and transparency; and the programme for the European Nuclear Safety Conference scheduled for 28/29 June 2011.

At its 15th meeting in mid-May, ENSREG discussed the scope and modalities of the risk and safety assessments, the so-called "stress tests", in all 143 nuclear power plants in the European Union, as requested by the European Commission and the European Council. On 24 May 2011, a consensus was reached between ENSREG and the European Commission on comprehensive and transparent stress tests with regard to which ENSREG will make full use of available expertise, notably from the Western European Nuclear Regulators Association (WENRA).[3]

Stress tests are defined as a "targeted reassessment of the safety margins of nuclear power plants in the light of the events which occurred at Fukushima: extreme natural events challenging the plant safety functions and leading to a severe accident".[4]

Starting on 1 June 2011, all operators of nuclear power plants in the EU will have to review their nuclear power plants against extreme situations. In particular, operators will have to check and improve mitigation measures available after a potential loss of safety functions, including the loss of electrical power. The operators' reports will first be reviewed by the national nuclear regulators who will then prepare national reports which will be reviewed by teams, set up by ENSREG.

International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry (2010)

The IAEA, in co-operation with several entities including the European Commission, organised an International Symposium on Standards, Applications and Quality Assurance in Medical Radiation Dosimetry held in Vienna, Austria from 9 to 12 November 2010. The goal of the symposium was to provide a forum in which advances in radiation dosimetry, in radiation medicine and radiation protection could be disseminated and relevant scientific knowledge exchanged. It included all specialties in radiation medicine and radiation protection dosimetry with a specific focus on those areas where the standardisation of dosimetry has improved in the recent years (brachytherapy, diagnostic radiology and nuclear medicine). It both summarised the current status of, and outlined future trends in, medical radiation dosimetry and identified possible areas for improvement. Its conclusions and summaries should lead to the formulation of recommendations for the scientific community.

International Atomic Energy Agency

Fifth review meeting of the Convention on Nuclear Safety (2011)

The fifth review meeting of contracting parties to the Convention on Nuclear Safety (CNS) was held at the IAEA headquarters, Vienna, Austria, from 4 to14 April 2011. The meeting was attended by 61 out of 72 contracting parties to the convention and was presided over by Mr. Li Ganjie, of the People's Republic of China. The OECD Nuclear Energy Agency was invited to attend as an observer.

3. See declaration about the EU stress tests by Mr. Andrej Stritar, Chairman of ENSREG, available at ENSREG's website.
4. www.ensreg.eu/sites/default/files/EU%20Stress%20tests%20specifications_0.pdf.

The CNS entered into force on 24 October 1996. The main objective of the convention is "to achieve and maintain a high level of nuclear safety worldwide through the enhancement of national measures and international co-operation including, where appropriate, safety-related technical co-operation" [Article 1(i) CNS]. Obligations under the convention cover, *inter alia*, siting, design, construction, operation, the availability of adequate financial and human resources, quality assurance and emergency preparedness.

Pursuant to Articles 20 and 21 of the CNS, contracting parties shall hold meetings at least every three years for the purpose of reviewing the national reports presented by each party on measures taken to implement each of the obligations under the convention. Accordingly, contracting parties submitted national reports seven and half months before the review meeting. In the following months, they reviewed each other's reports and exchanged written questions, answers and comments in preparation for the meeting.

Review meeting – observations

The fifth review meeting was the first major international nuclear safety meeting following the accident at the Fukushima Daiichi nuclear power plant caused by the earthquake and tsunami on 11 March 2011.

In order to stimulate discussion on the Fukushima Daiichi accident, the President requested that the following nine topics be addressed by the contracting parties during the country group presentations:

1. nuclear power plant design against external events;
2. off-site response to emergency situations (e.g. station blackout);
3. emergency management and preparedness following worst case accident scenarios;
4. safety consideration for operation of multi-units at the same nuclear power plant site;
5. cooling of spent fuel storage in severe accident scenarios;
6. training of nuclear power plant operators for severe accident scenarios;
7. radiological monitoring following nuclear power plant accident involving radiological release;
8. public protection emergency actions; and
9. communications in emergency situations.

In addition, the contracting parties agreed that national reports for future review meetings should include the response of the contracting parties to any lessons emerging from the Fukushima Daiichi accident, including any potential additional measures to help prevent a recurrence of such an accident. Any necessary changes to severe accident management or mitigation arrangements should also be included.

Finally, contracting parties agreed to issue a statement, reproduced below, and to analyse the relevant issues of the accident, *inter alia*, at an extraordinary meeting of contracting parties to be held in 2012.

CNS statement on the Fukushima Daiichi accident

> "The Contracting Parties expressed their deepest condolences to the Japanese people for the losses they have suffered as a result of the devastating earthquake and tsunami. The Contracting Parties pay tribute to the countless acts of heroism

and selflessness of the Japanese people in addressing the consequences of the Fukushima Daiichi nuclear accident.

Japan is not alone in its hour of need. The Contracting Parties affirm their solidarity with the Japanese people and continue to offer support to the Japanese in their efforts to respond to the nuclear accident at the Fukushima Daiichi power plant.

The international community recognizes the significance of the Fukushima nuclear accident, which highlights the need to consider new challenges and underlines the paramount importance of safety in the use of nuclear energy.

The Contracting Parties reaffirm their commitment to the objectives of the Convention on Nuclear Safety: to achieve and maintain a high level of nuclear safety worldwide through the enhancement of national measures and international cooperation; to establish and maintain effective defences in nuclear installations against potential radiological hazards; and to prevent accidents with radiological consequences and to mitigate such consequences should they occur.

The Contracting Parties are committed to draw and act upon the lessons of the Fukushima accident. In line with their national responsibilities, all Contracting Parties are already carrying out reviews to ensure the continued safety of their existing and planned nuclear power plants and are committed to taking prompt actions as lessons are learnt. It is understood that the lessons learnt process cannot be completed until sufficient additional information is known and fully analysed. Japan has committed to provide this information as soon as possible.

The IAEA has a statutory function to establish safety standards. Upon request, the IAEA also facilitates the provision of international assistance to a State facing a nuclear or radiological emergency. While recognising their national responsibilities, the Contracting Parties are committed to the continuing important role of the IAEA in the area of nuclear safety. The Contracting Parties welcome the initiative by the Director General of the IAEA to convene a Ministerial Conference on Nuclear Safety from June 20 to 24, 2011 in Vienna. The Contracting Parties support the Director General's aims of the conference that 'will provide an opportunity to make an initial assessment of the Fukushima accident, consider lessons that need to be learnt, help launch a process to strengthen global nuclear safety and consider ways to further strengthen the response to nuclear accidents and emergencies.' The Contracting Parties are committed to actively contribute to this process.

The contracting parties will hold a dedicated meeting in 2012 on the Fukushima accident. The aim of the meeting is to enhance safety through reviewing and sharing lessons learnt and actions taken by Contracting Parties in response to the events of Fukushima and to reviewing the effectiveness and, if necessary, the continued suitability of the provisions of the Convention on Nuclear Safety."

International Expert Group on Nuclear Liability (2011)

The International Expert Group on Nuclear Liability (INLEX) established by the Director-General in 2003, held its 11th meeting from 25 to 27 May 2011. During the course of its meeting, the group placed an important focus on the liability and compensation arrangements which are expected to apply to the Fukushima accident in Japan.

In relation to the situation in Japan, the group touched upon the precedent set by the 1999 Tokai-mura accident, the Fukushima accident and the related legal issues in connection with the application of Act No. 147 of 1961, as amended by Act No. 19 of 2009, on Compensation for Nuclear Damage. Issues discussed revolved around the channelling of liability to the operator, the government indemnity in the case of

earthquake or tsunami and the concept of exemption from liability in the case of "damage caused by a grave natural disaster of an exceptional character".

Other major topics discussed during the meeting included, *inter alia*, the workshop organised in Brussels, in June 2010, by the European Commission (EC) and the Brussels Nuclear Law Association on the "Prospects for a Civil Nuclear Liability Regime in the Framework of the European Union" followed by the first meeting of the Working Group on Nuclear Liability in the European Union in Luxembourg in April 2011; the German proposals to allow contracting parties to exclude certain small research reactors and nuclear installations being decommissioned from the scope of application of the international nuclear liability conventions; INLEX's outreach activities; and the draft explanatory text of the Joint Protocol.

INLEX was advised that as a result of the workshop organised in Brussels, in June 2010, by the EC and the Brussels Nuclear Law Association on the "Prospects for a Civil Nuclear Liability Regime in the Framework of the European Union", it was agreed that a working group to discuss nuclear liability and insurance would be established. The group took note that the first meeting of this working group was held in April 2011 in Luxembourg and that the purpose of this meeting was to explore common ground amongst the stakeholders who should give recommendations for a future proposal of the EC under Article 98 of the Euratom Treaty. The group received reassurances that the EC did not want to pursue any option which would work against the possibility of the future creation of a global regime based on the Convention on Supplementary Compensation, and that any EC proposal would work on the basis of the current nuclear liability principles, including channelling of liability exclusively to the operator.

Concerning the proposals by Germany, the Secretariat gave an update on the situation and recalled that, following the 10th INLEX meeting, the joint meeting of RASSC and WASSC, on 1 July 2010, had endorsed the three exclusion criteria that a contracting party would need to apply against an installation proposed for exclusion. In light of revisions introduced by the German delegations, the group agreed to defer decision on the revised proposals so as to allow the IAEA technical committees (RASSC and WASSC) to properly evaluate them and to take into account further developments under the auspices of the OECD/NEA over this matter as well.

In addition, the group reviewed INLEX's outreach activities with special reference to the fifth Workshop on Civil Liability for Nuclear Damage which was held in Moscow, from 5 to 7 July 2010, for countries of Eastern Europe and Central Asia and the International Workshop on the Convention on Supplementary Compensation for Nuclear Damage which was organised by the IAEA together with the Republic of Korea and held in Seoul on 10-11 February 2011.

The Secretariat also introduced the group to the revised version of the draft explanatory text on the Joint Protocol. The group endorsed the proposed text and requested that it be published as part of the IAEA International Law Series with the same status as the explanatory texts for the 1997 Vienna Convention and the 1997 Convention on Supplementary Compensation.

The next meeting of INLEX will take place in May 2012.

Open-ended meeting of technical and legal experts on the Code of Conduct on the Safety and Security of Radioactive Sources (2011)

An open-ended meeting of technical and legal experts to review and revise the Guidance on the Import and Export of Radioactive Sources (the guidance), was held from 30 May to 1 June 2011 at the IAEA headquarters in Vienna.

The meeting was open to all states (IAEA member states and non-member states) and was attended by 150 experts from 82 member states of the IAEA. As of May 2011, 103 states have notified the Director-General of their intention to act in accordance with the Code of Conduct on the Safety and Security of Radioactive Sources (the code), and 64 of those states have additionally notified the Director-General of their intention to act in accordance with the guidance.

The experts conducted a thorough review of the draft revised guidance proposed following the consultancy meeting held in January 2011, and agreed on a final text to be considered by the agency's policy-making organs. During the discussions, the following points received particular attention:

- management of disused sources;
- role and responsibilities of the point of contact;
- the important role which bilateral arrangements could play in the harmonised and efficient implementation of the code;
- the possibility of including in the guidance a provision for notification of receipt of a source or sources to the exporting state;
- the importance of applying as many of the standard processes as possible to the export of a source under the "exceptional circumstances" provision;
- the importance of expanding Annex 1 to the guidance in order to make it a more useful tool for exporting states and to more closely align it with the current structure of the agency's programmes in the area of radiation safety.

Ministerial conference on nuclear safety (2011)

A five-day ministerial conference on nuclear safety took place from 20 to 24 June 2011 at the IAEA's headquarters in Vienna, Austria.[5] The conference was convened by the IAEA in the wake of the 11 March 2011 nuclear accident at the Fukushima Daiichi nuclear power station in Japan.

The aim of the conference was to identify lessons learnt from the accident and to strengthen nuclear safety throughout the world. The President of the conference was Ambassador Antonio Guerreiro from Brazil.

Working sessions covered future actions for the continuous improvement of nuclear installation safety, the initial response to the accident, emergency preparedness and response, lessons learnt in response to the accident and the way forward, as well as the global nuclear safety framework. A wide range of experts participated in working sessions, including representatives from nuclear regulatory agencies, technical service organisations, international organisations and NGOs.

The IAEA Director-General Yukiya Amano announced in his opening statement that the conference would be part of a "lengthy process of establishing a comprehensive post-Fukushima nuclear safety framework, building on the valuable system that is already in place". He made five proposals which "could contribute to establishing a realistic and enhanced post-Fukushima nuclear safety framework":

1. strengthening IAEA safety standards and ensuring that they are universally applied;
2. systematically and regularly reviewing the safety of all nuclear power plants by both member states and IAEA review missions;

5. www.iaea.org/newscenter/news/2011/confsafety200611.html.

3. ensuring that regulatory bodies are as effective as possible;
4. strengthening the global emergency and preparedness and response system;
5. strengthening the IAEA's role so as to expand the information-sharing function to include providing analysis.

International Nuclear Law Association

20th Nuclear Inter Jura (2012)

The next International Nuclear Law Association (INLA) Congress, scheduled to take place in Bucharest, in Romania, from 24 October to 28 October 2011 was postponed to the spring of 2012 in order to better and fully address the legal consequences of the nuclear accidents in Japan's Fukushima Daiichi nuclear power plants.

The exact date and location of the congress will be communicated to the INLA members in due course.

The purpose of INLA, created in 1972, is to promote the study of legal issues associated with the peaceful uses of nuclear energy and to encourage the exchange of information in this field. Every two years INLA organises a congress called "Nuclear Inter Jura" in which nuclear lawyers from all around the world participate. INLA membership numbers approximately 650 persons.

Organisation for Economic Co-operation and Development

50th anniversary (2011)

2011 marks the 50th anniversary of the Organisation for Economic Co-operation and Development (OECD).

The OECD was created in 1961 to succeed the Marshall Plan and promote economic co-operation, growth and development. It has evolved into a forum for governments, business, labour and civil society from member countries as well as others to address common challenges and agree on policies for better lives. Article 1 of the OECD's founding convention states that its role is "to promote policies designed to achieve the highest sustainable economic growth and employment and a rising standard of living" in member countries, partner countries and on a global scale. The OECD counts 34 member countries and has its headquarters in Paris, France.

The 2011 OECD Forum and Ministerial Council Meeting under the chairmanship of the United States of America built around a special programme showcasing how the OECD has helped raise standards of life and how, in the future, the OECD can enhance its contribution towards a more resilient and balanced world economy.

OECD Nuclear Energy Agency

G8-G20 extended meeting on nuclear energy (2011)

On 7 and 8 June 2011, as part of the international efforts to learn from the accident at Japan's Fukushima Daiichi nuclear power plant and help prevent similar disaster in the future, the OECD Nuclear Energy Agency co-organised a G8-G20 ministerial seminar on nuclear energy issues. It took place under the French Presidency to G8/G20 at the OECD's headquarters in Paris, France.

On 7 June 2011, ministers from 33 countries stated that all countries with nuclear facilities should carry out safety audits or "stress tests" based on initial feedback from the accident at the Fukushima Daiichi nuclear power plant in Japan. They called for reinforcement of the safety activities of the OECD Nuclear Energy Agency with a view to greater harmonisation of safety practices, and they said that it was necessary to reinforce "the global role and missions" of the International Atomic Energy Agency (IAEA), and in particular the nuclear safety review mechanisms for which it is responsible.

They also proposed that the IAEA review its safety standards in light of the Fukushima Daiichi accident and ensure their proper application. In particular, the IAEA should review its standards on the construction and operation of nuclear power plants in seismic zones while taking into account the impact of climate-related events.

Other proposals discussed at the seminar included the development of "emergency intervention teams" for crisis management at nuclear facilities. Ministers called for crisis management training to be carried out at international level in order to benefit from the maximum amount of experience.

On 8 June 2011, at the "Forum on the Fukushima Accident – Insights and Approaches",[6] the regulatory authorities from the G8, OECD NEA member countries and associated countries including Brazil, India, Romania, South Africa and Ukraine backed calls for worldwide stress tests at nuclear facilities and said that they would work together to implement lessons learnt from the accident at Fukushima Daiichi in Japan. They expressed that they wanted all regulators responsible for nuclear facilities to launch reviews similar to safety audits or "stress tests" being carried out in Europe as soon as possible.

The priority areas would include extreme external natural events and resilience to external shocks, including combined risks, plant design and the ability of safety systems to withstand severe accidents. Other key areas include emergency response and management capabilities, crisis communication, and site recovery plans and their implementation.

Regulators also asked the NEA committees, including the Committee on the Safety of Nuclear Installations (CSNI) and the Committee on Radiation Protection and Public Health (CRPPH), to carry out additional technical analyses and share the results internationally.

Among the participating regulators were Gregory B. Jaczko (Chairman of the US Nuclear Regulatory Commission), André-Claude Lacoste (Chairman of the ASN, France), Koichiro Nakamura (Deputy Director-General for Nuclear Safety, NISA, Japan), Mike Weightman (Chief Inspector of the UK Office for Nuclear Regulation), Nikolay Kutin (Chairman of Rostechnadzor, Russia), Jukka Laaksonen (Director-General of STUK, Finland).

New education programme in international nuclear law (2011)

The first session of the NEA's new education programme in international nuclear law will take place between 3 and 7 October 2011 at the NEA's headquarters near Paris, France. The programme is geared to professionals with a demanding work schedule and aims at providing a high-quality, comprehensive and intensive course in international nuclear law.

6. Held under the auspices of the OECD NEA's Committee on Nuclear Regulatory Activities (CNRA).

The number of participants is limited to approximately 60. More information on this programme and an application form can be downloaded from the NEA website or requested at inle@oecd-nea.org.

NEA membership (2011)

On 11 May 2011, Slovenia became the 30th member country of the OECD Nuclear Energy Agency (NEA).

Slovenia has been an active member of the international nuclear community since its independence in 1991. It is party to the main treaties and agreements on non-proliferation of nuclear weapons and on co-operation with regard to the peaceful uses of nuclear energy. It is also a party to the Paris Convention on Third Party Liability in the Field of Nuclear Energy and the Brussels Supplementary Convention.

Slovenia has been an observer in the seven NEA standing technical committees since 2002 and joined the Organisation for Economic Co-operation and Development (OECD) in July 2010.

It operates the Krško nuclear power plant, a one-unit 696 MWe pressurised water reactor (PWR) connected to the grid in 1981 and co-owned with Croatia. The reactor supplies 25% of the country's electricity demand. Slovenia also operates a nuclear training centre and a research reactor at the Jožef Stefan Institute.

Bibliography

Guide to Nuclear Law by Burges Salmon (2010)

Burges Salmon LLP, a renowned British law firm with international presence, published in December 2010 the Burges Salmon *Guide to Nuclear Law*.

The book is "a practitioner's guide to nuclear law" with a collection of practical articles on important nuclear law topics.[1] The authors provide a thorough overview of the current national and international nuclear law landscape to the renascent nuclear industry in the United Kingdom. The guide is written from the industry's perspective, with less focus on regulatory matters. It is also largely based on nuclear law in the United Kingdom, with a number of references to European and international law.

The guide is over 400 pages long, divided into 19 separate chapters and four appendices, all written by the Burges Salmon nuclear team. It includes several tables and diagrams, which makes certain concepts and processes easier to understand.

Chapter 1 presents the origins of the nuclear industry in the United Kingdom. In Chapter 2 the basics of nuclear law are introduced, especially the rationale behind the regulatory regime of nuclear activities with the "3 S L approach" (overlapping concepts of safety, security and safeguards with the concept of liability as a focal point).

Chapters 3 to 9 deal with very diverse areas of nuclear law, from nuclear liability to long-term disposal, via transport and export controls. As with the rest of the guide, most chapters are 15 to 20 pages long. Chapters are well structured and contain several examples from different facilities in the United Kingdom.

Chapters 10 to 17 focus on the industry perspective as this part of the guide gives an illustration of the successive steps and the different aspects of new build in the United Kingdom, such as planning and justification, construction contracts, real estate, the environment and legal controls relating thereto, the development of an international regulatory capacity, licensing and operation of nuclear power plants.

Chapters 18 and 19 focus on two very important fields outside of electricity generation: the control of high activity sealed sources and the regulatory regime applicable to research reactors.

The appendixes offer an interesting corpus of documents with a glossary of nuclear terms, the reproduction of the *Health and Safety Executive Nuclear Site License Conditions Guide*, a list of acronyms used at the Nuclear Decommissioning Authority as well as short biographies of the authors.

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