

## **Law on the Peaceful Uses of Nuclear Energy: Key concepts**

**by Diane de Pompignan\***

According to the Concise Oxford Dictionary, the word “concept” means “an idea or mental picture of a group or class of objects, formed by combining all their aspects”. Without getting into a philosophical discussion about the nature of a concept, if we want to identify and examine in a critical fashion the key concepts which ought to be included in a general domestic law governing the peaceful uses of nuclear energy, then we need to agree on the definition of the word “concept”.

Several points have to be considered in this respect: first, are the key concepts specific to nuclear law or are they found in the ordinary law but with a particular meaning in the context of nuclear legislation? Secondly, if a concept is not the same as a principle, do we not need to adopt a wide definition of the word, since, as between the two terms, it is used in legal language much less frequently? A principle is defined as “a fundamental truth or proposition serving as the foundation for belief or action” and when used in a legal context, does not seem to differ much from a concept; both designate an element or a general standard under which several more operational norms can be organised.

We shall therefore, in this study, adopt a wide definition of the term “key concept” which is made up of two categories: general categories resulting from the principles of nuclear law, such as the “safe management of radioactive waste”, which is based on the principle of safety, the foundation of all nuclear regulation, and “physical protection”, a reflection of the principle of non-proliferation and security; and general legal categories almost always included in general nuclear legislation such as “licence”, “control” and “compensation”.

The definition of “concept” does not include technical or legal terms which, although used in nuclear legislation, have to do with what is being regulated and not to the rules themselves. Such terms include “nuclear installation”, “nuclear material”, “deep geological waste repository” or “facility”, and the “commissioning” of an installation.

Having defined the word “concept”, we must now consider whether it is relevant to introduce concepts into a general nuclear law, and this involves an analysis of the nature of the obligation or reason for so doing: is it a binding legal obligation resulting from international commitments, or is the

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reason rather moral or ethical, in view of the nature of the risks involved in the use of nuclear energy? Is their use in legislation related to a particular national social context or based on operational or practical grounds in the belief that they provide a better guarantee that norms will be applied? In this context, key concepts will be categorised according to their origin and the reason for their inclusion in nuclear legislation. This, in turn, requires consideration of their scope and effectiveness inasmuch as they have legal force and effect.

An examination of the reason for including certain key concepts in such a general law requires taking into account the fact that it is designed to cover all branches of nuclear law and to be supplemented or applied through the adoption of other laws or regulations. As such, it is different from implementing regulations, special legislation or general legislation regulating other subjects but including nuclear activities. A general nuclear law would normally address issues relating to radiation protection, the safety of nuclear installations, nuclear liability, transport and trading in radioactive materials, as well as radioactive waste management.

In addition, such a law usually applies only to the peaceful uses of nuclear energy, i.e. all civil activities involving radioactive substances, nuclear materials or installations and equipment generating ionising radiation.<sup>1</sup> All military nuclear activities are generally excluded.

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In order to classify these key concepts and to analyse the reasons for their inclusion, it would seem helpful to undertake an analysis of existing legislation, and in particular, recent legislation which *a priori* reflects current general trends in nuclear law. Such analysis, based on translations of national legislation, inevitably leads to inconsistencies. Such an analysis shows that it is possible to include a number of key concepts deriving from the principles of nuclear law or from more operational categories of legislation (I), the effectiveness of which depends on a combination of legal and non-legal conditions, and the choice of which remains, above all, national (II).

## **I. Key concepts: nuclear law principles or general law concepts**

Nuclear law is based on a number of principles which may be inserted into a general atomic law for legal or practical reasons.

A distinction can be made between two types of key concepts in a general nuclear law. The first covers specific nuclear law concepts resulting from principles which are based on a legal obligation or on the actual purpose of a nuclear law to establish guidelines and priorities (A). The second refers to categories of general law which reflect these principles in more practical terms, thereby facilitating the application of the provisions of the general law in other legislation (B).

### **A. Concepts arising from nuclear law principles**

An analysis of the key concepts used in a general law governing the peaceful uses of nuclear energy shows that many of them derive from the general principles of nuclear law. Of these, a distinction can be made between specific principles of nuclear law – some of which cross-cut all nuclear activities, while others apply to certain nuclear activities only – and principles of a more universal nature.

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1. Hungarian Act CXVI of 1996 on Atomic Energy, Section 2.

The first of the cross-cutting nuclear law principles appears to be that of safety, which can be further divided into the subsidiary principles of prevention, protection and precaution. Given the special hazards related to the use of nuclear energy, one of the objectives of a nuclear law must be to promote the exercise of caution, prevent potential damage and mitigate the adverse effects of misuse or accidents. Thus, many pieces of legislation include key terms relating to safety or its subsidiary principles, these latter often being cited directly. Direct references may be made to the safety principle: “guaranteeing nuclear safety”, “adequate standards of nuclear safety”,<sup>2</sup> the “safe use of energy”,<sup>3</sup> to concepts referring to it implicitly: “preventive measures”,<sup>4</sup> “acceptable level of risk”,<sup>5</sup> or to concepts emanating from it, such as “quality assurance”. This last concept refers to the need to ensure “quality of nuclear installations and activities at all stages during the life of a nuclear installation”.<sup>6</sup>

A second category of cross-cutting principles is those which govern the dealings between the various persons involved in the use of nuclear energy. These include the principle of the independence of the nuclear regulatory authority, which must be given the resources and powers necessary for the impartial exercise of its functions.<sup>7</sup> Mention must also be made of the principle of liability which implies not only that each state is responsible for the nuclear installations on its territory,<sup>8</sup> but also that the operator of a nuclear installation has primary responsibility for the safety of his/her installation.<sup>9</sup> Furthermore, the principles of transparency and participation, which imply an “obligation to inform the public” or the “right of the public to information”<sup>10</sup> about the use of nuclear energy, and the involvement of all the persons concerned in the formulation of nuclear regulations, may also be included in a general nuclear law.

A general nuclear law can include a number of key concepts arising not only from cross-cutting principles but also from principles relating to certain specific nuclear activities. Since it governs peaceful activities, a general nuclear law may refer to the principle of the peaceful uses of nuclear energy (principle of non-proliferation),<sup>11</sup> which ensures that nuclear materials and technologies are traded or used for strictly peaceful purposes inasmuch as they can also be used to develop nuclear weapons. One of the concepts deriving from this principle is that of “physical protection”, meaning “a system of technical and organisational measures, the aim of which is to prevent unauthorised activities

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2. Lithuanian Nuclear Energy Act of 1996, Sections 3 and 27.
  3. Canadian Act to establish the Canadian Nuclear Safety Commission, Section 6.
  4. Lithuanian Act, *op. cit.*, Section 14.
  5. Hungarian Nuclear Energy Act of 1996, Section 9.
  6. Slovak Act on the Peaceful Use of Nuclear Energy of 1998, Section 22.
  7. Lithuanian Act, *op. cit.*, Section 3.
  8. Lithuanian Act, *op. cit.*, Section 4.
  9. Croatian Act on Nuclear Safety of 2003, Section 3.
  10. Slovak Act, *op. cit.*, Section 31.  
Norwegian Act on Radiation Protection and Use of Radiation of 2000, Sections 14 and 18.
  11. Czech Act of 1997 on the Peaceful Uses of Nuclear Energy, Section 4.  
Hungarian Act, *op. cit.*, Section 3.  
Swiss Nuclear Energy Act of 2003, Section 4.

with nuclear installations or nuclear materials”,<sup>12</sup> of “defence in depth”, which requires the existence of several barriers protecting nuclear materials, or “non-proliferation safeguards”.<sup>13</sup>

Nuclear legislation may also refer to the principles of radiation protection, which constitute the justification for the practices adopted – human activity requiring the use of nuclear energy is authorised only if, following a cost-benefit analysis, it is recognised that it produces a net positive benefit for society; the principle of optimisation – all exposures must be as low as can reasonably be achieved;<sup>14</sup> and the principle of dose limitation<sup>15</sup> – the dose equivalent received by individuals must not exceed certain recommended limits. Concepts such as “optimal radiological safety”<sup>16</sup> and “dose limits”<sup>17</sup> are derived from these principles.

Over and above specific nuclear law principles, direct or indirect references to other principles based on broader universal considerations may also be included in a general nuclear law. Because of the scale of the risks associated with the uses of nuclear energy and the irreversible consequences which future generations might suffer as a result of actions taken by the present generation, many nuclear laws include universal principles such as “sustainable development” or “limitation”<sup>18</sup> or (radioactive) “waste management” which mean that a society should strive for development which can satisfy the needs of present generations without preventing future generations from satisfying theirs. Sometimes references are made instead to: “protecting human life”, “protecting man and the environment”, “socially-accepted risks”,<sup>19</sup> “consequences on the gene pool”.<sup>20</sup>

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Thus, general domestic laws governing the peaceful uses of nuclear energy are likely to include a number of key concepts deriving from the principles of nuclear law or from universal principles, and an analysis should be made of the reasons dictating their inclusion. These reasons can relate both to legal obligations and to the very purpose of a nuclear law to establish general guidelines and priorities.

The origin of some of the nuclear law principles mentioned above lies in binding international conventions, but most principles concerning safety and radiation protection are based on “soft law” instruments.

The first group includes, essentially, the principles relating to the peaceful uses of nuclear energy whose origin lies in the Nuclear Non-Proliferation Treaty of 1968 and the Convention on the Physical Protection of Nuclear Material of 1979, as well as the liability principles laid down in the

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12. Slovak Act, *op. cit.*, Section 23.
  13. Australian Nuclear Non-Proliferation (Safeguards) Act 1987.
  14. ALARA Principle, As Low As Reasonably Achievable.  
Norwegian Act, *op. cit.*, Section 5; and Lithuanian Act, *op. cit.*, Section 3.
  15. Swiss Act, *op. cit.*, Section 30 and Hungarian Act, *op. cit.*, Section 4.
  16. Latvian Act of 2000 on Radiological Safety and Nuclear Safety, Section 3.
  17. Norwegian Act, *op. cit.*, Section 5.
  18. Swiss Act, *op. cit.*, Section 30.
  19. Hungarian Act, *op. cit.*, Section 1.
  20. Norwegian Act, *op. cit.*, Section 1.  
Bulgarian Act of 2002 on the Safe Use of Nuclear Energy, Section 3.  
Swiss Act, *op. cit.*, Section 4.

Vienna Convention of 1963 and the Paris Convention of 1960, as amended. Mention may also be made of the principles relating to safety which are, for the most part, included in the Convention on Nuclear Safety and the Joint Convention of 1997 on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management. For example, the concept of “quality assurance” is referred to in Article 13 of the Safety Convention and Article 23 of the Joint Convention. Thus, if a state has ratified one of these binding conventions, it will be obliged to include in its legislation the provisions and concepts referred to in them. Each Contracting Party commits itself to taking, “within the framework of its national law, the legislative, regulatory and administrative measures (...) for implementing its obligations under this convention”.<sup>21</sup>

However, as noted above, most of the principles relating to safety and radiation protection are laid down in soft law instruments, essentially in the form of recommendations. With regard to radiation protection, the principles are based on the recommendations published periodically by the International Commission on Radiological Protection (ICRP). The safety principle has been widely supported thanks to the recommendations of the International Atomic Energy Agency, which has published in its “Safety Standards” series provisions affecting all aspects of nuclear safety. Some of the safety principles, such as that of precaution, together with the more universal principles, such as protecting the environment and preserving the patrimony of future generations, were formulated within the context of the development of environmental law, and are based on the incentives or statements contained, for example, in the Rio Declaration on Environment and Development, adopted at the United Nations Conference on Environment on 5 June 1992.

In this context, the legal obligation on states to introduce into their national legislation the concepts mentioned in these instruments would appear more tenuous but is not non-existent. For, while the standards are not in themselves binding on Contracting Parties, it is possible for them to become binding if they are incorporated into international customary law through the existence of an *opinio juris*, and of national practices which are in conformity with them and repeated over time. However, while it is recognised that certain principles can be considered as having been approved by *opinio juris*,<sup>22</sup> the practice element is often more difficult to establish.

Thus, the inclusion in a general nuclear law of key concepts deriving from the principles of nuclear law can apparently result from an international legal obligation or from their inclusion in international nuclear law instruments, even non-binding ones, which express concerns shared by all nations. Such inclusion also appears to be linked to the very purpose of a nuclear law to establish orientations and priorities. Thus, most general domestic legislation governing nuclear activities includes a specific provision guiding the application of nuclear law principles which are then stated elsewhere in the text. For example, many laws state the absolute priority given to safety.<sup>23</sup> Thus, concepts deriving from the principles of nuclear law can be said to be “key” when they are recognised as having priority, such priority possibly resulting from their acceptance at international level.

A study of the general nuclear laws adopted recently throughout the world shows that it is possible to introduce into such legislation a number of key concepts deriving from the principles of nuclear law. As most such key concepts are general in nature and difficult to translate into traditional

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21. Joint Convention of 1997 on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Article 18.
  22. It is interesting here to refer, for example, to the Principles in the Rio Declaration, the statement of which can help begin to establish an *opinio juris*.
  23. Hungarian Act, Section 4; Slovak Act, Section 3, and Croatian Act, Section 3.

legal terms, the introduction of a second category of key concepts, general law which can take on a particular meaning in the context of nuclear law, is necessary.

### ***B. Concepts deriving from general law***

General nuclear legislation contains key concepts which are, in fact, general law categories included for practical reasons and which convert internationally recognised principles of nuclear law into legal terms. At the same time, they establish a legal framework allowing for the adoption of subsidiary instruments which implements that general legislation.

These general law concepts are used in other domestic laws governing other types of hazardous activities and may, in the context of nuclear legislation, take on a particular meaning specific to nuclear law. They may be classified into three groups: first, licensing procedures; second, control procedures; and third, accident procedures involving nuclear materials.

Nuclear activities are by their nature hazardous, and their regulation must be dictated by safety considerations, including protection and precautionary measures aimed at avoiding nuclear proliferation. The most important method of ensuring the implementation of these considerations is the requirement for a “licence” to undertake any activity using nuclear energy, such licence normally being issued to the nuclear operator by the “regulatory” or “licensing authority”. Indeed, hazardous activities, whether nuclear or not, are often subject to a prior licensing regime. For example, the Environment Code of France provides for such a regime for activities capable of generating pollution or harmful effects.

Where licensing regimes are in place, the key terms “licence” and “licensing authority” appear in all general nuclear laws. A specific example is Section 4 of the Slovak Act on the Peaceful Uses of Nuclear Energy of 1998: “The use of nuclear energy or carrying out of activities in the sphere of the use of nuclear energy shall only be permissible on the basis of an authorisation issued by the Nuclear Regulatory Authority of the Slovak Republic to a legal person or a natural person who complies with the conditions set out by the general regulation on these activities and by this act (...).” A licence may also be required for certain specific activities: for the storage of nuclear fuel and for installations, for example,<sup>24</sup> to handle nuclear materials and construct and operate a nuclear power plant,<sup>25</sup> and to transport or import nuclear materials,<sup>26</sup> this last category of licence addressing more specifically concerns about nuclear non-proliferation.

The second general law category which might be included in a general nuclear law has to do with “control”. If an activity is subject to authorisation, it is essential to monitor compliance with the licensing conditions by the licence-holder. Exercising control over regulated activities is also typical of administrative law and is carried out by administrative discipline. Moreover, in order to protect the environment, which can be damaged by certain activities and in particular nuclear ones, it is also necessary to carry out systematic and preventive controls to ensure that even if regulations are complied with, the risk of nuclear damage is contained. These two aspects of control are found in

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24. German Act, *op. cit.*, Section 6 *et seq.* and *Bulgarian Act*, Section 98.

25. Swiss Act, *op. cit.*, Sections 6 and 13 *et seq.*

26. German Act on the Peaceful Utilisation of Atomic Energy and the Protection against its Hazards, as amended in 2002, Sections 3 and 4.

national legislation governing numerous activities<sup>27</sup> and take on particular importance in the context of nuclear activities in view of the potential risks involved.

In fact, a general nuclear law may include numerous references to the “control” concept such as “surveillance” or “evaluation”. Legislation may refer to controlling the safety of installations,<sup>28</sup> the concentration of radioactive elements in a given place, doses of radiation received by certain persons, or the conditions for issuing a licence.<sup>29</sup> It is important to note that the term “control” has a specific meaning in nuclear law. Thus, the expression “institutional control” usually designates the control measures taken after the closure of a nuclear waste repository.

Lastly, there may be provisions dealing with the risk of a nuclear or radiological accident. In this case three different general law categories are involved: the “third party liability” of the person responsible and the “compensation of victims” by means of “insurance” or a “guarantee”; the issuing of “sanctions”,<sup>30</sup> and the application of “emergency” measures involving the designation of a “national contact point” and “notification” of all the competent authorities. All these terms, which are used in other, non-nuclear, legislation, may be included in a general nuclear law.

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The introduction of such general law categories is based on a two-fold practical consideration, as much as on a legal obligation. Their inclusion in a general nuclear law may result from an international undertaking by the country concerned. All these general law categories are found in the main conventions and other instruments of international nuclear law. Thus, the terms “licence” and “control” appear frequently in the Safety Convention [see in particular Article 7], the Joint Convention [see Article 19], and the IAEA Code of Conduct on the Safety and Security of Radioactive Sources [Articles 18 and 19 in particular], while accident categories such as “compensation and liability” can be found in the above-mentioned Vienna and Paris Conventions, and the category of punishable “offence” is used in the Convention on Early “Notification” of a Nuclear “Accident” and the Convention on the Physical Protection of Nuclear Material (Article 7 provides that certain types of conduct constitute offences). Thus, in the same way general principles in a nuclear law are likely to be based on a legal obligation, general law categories used in these same international instruments also seem to flow from such obligations.

Certain key concepts deriving from the fundamental principles of nuclear law refer to practical measures, whereas others essentially lay down objectives and priorities. In both cases, the concepts

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27. Thus, Article L512-11 of the French Environment Code provides: “Certain categories of installation dealt with in this section [installations capable of generating pollution and harmful effects ], defined by decree in the *Conseil d’Etat* because of the risks they present, may be subject to periodic controls enabling the operator to be sure that his installations are operating in compliance with the conditions required by the regulations. Such controls shall be carried out at the cost of the operator by approved bodies”. As to regular controls to ensure that the natural environment is maintained in equilibrium, reference can be made for example to Article L211-2 of the Environment Code which provides that the river police shall carry out technical controls of installations, works or operations which can affect water quality.
  28. See, for example, the Croatian Act, *op. cit.*, Section 11; and the Hungarian Act, *op. cit.*, Section 17.
  29. Lithuanian Act, *op. cit.*, Section 11.
  30. For example, Chapter 9 [Sections 88 *et seq.*] of the above-mentioned Swiss Act provides *inter alia* for sanctioning offences against security and safety measures, offences relating to nuclear articles or radioactive waste, and the abandonment of the possession of nuclear materials or radioactive waste.

have to be transposed into legal terminology when they are included in an act intended, in “traditional” law, to constitute a prescribed standard,<sup>31</sup> i.e. to lay down a general and enforceable rule.

The first category includes terms such as “dose limitation”, “liability”, “physical protection”, “guarantees” and “defence in depth”. The dose limitation principle can, in practice, be transposed into dose limits which must not be exceeded. However, compliance with these requirements has to be “controlled” in order to become a conventional legal technique. In the same fashion, the “liability” principle is transposed into legal terminology by reference to the operator’s “third party liability”, which is a legal category different from criminal liability.

Other key concepts which may be introduced into a general nuclear law are more difficult to assimilate to “traditional” law because of their generality and purpose. This applies for example to radiation protection principles apart from dose limitation. In its Communication No. 85/C347/03 of 31 December 1985, the European Commission states that “The basic principles of justification and optimisation of exposures, which were formulated in ICRP Publication 26 (...) are clearly only of general value, something which must be taken into account when introducing them into national legislative and administrative provisions”. In practice, such principles can be translated into legal terminology by means of the “licensing” procedure and “control” measures: ensuring compliance with licensing conditions can provide a basis for “controlling” application of the optimisation principle. Operators may be required, for example, to implement measures such as using techniques to maintain doses as low as reasonably achievable and conduct tests to ensure that doses are optimised.

This shows that the reason for including general law categories such as “licensing”, “control” and “liability” into a general nuclear law is that they can be used to convert into legal terms other more general concepts. Introducing such categories provides a basis for the adoption of subsidiary legislation (e.g. regulation) to implement a general nuclear law or provisions supplementary to it. For, subsidiary legislation may lay down the conditions required for obtaining a licence or establish thresholds or procedures for monitoring protection of the surrounding environment.<sup>32</sup>

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Thus, a general domestic law governing the peaceful uses of nuclear energy is likely to include two types of key concepts: the first deriving from the fundamental principles of nuclear law, and the second based on categories of general law. The reason for incorporating both results from legal obligations to do so or for practical considerations. This last consideration raises the question of the effectiveness and the implementation of the key concepts which have just been mentioned. Difficult to measure, their effectiveness seems to be subject to legal and non-legal conditions, whereas their implementation depends, in the final analysis, on national policy based on legal and ethical considerations.

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31. Lochard J., and Grenery-Boehler M.C., “Optimising radiation protection – the ethical and legal basis”, in *Nuclear Law Bulletin* No. 52.

32. For example, Section 25 of the above-mentioned Hungarian Act provides that “the Minister of Environment Protection and Regional Development shall provide for the inspection of the radioactive contamination of air, land and water environment”.

## II. The effectiveness of key concepts the implementation of which depends in the final analysis of national policy

### A. *Difficulty in measuring the effectiveness of key concepts*

While certain key concepts might or should, for various reasons, be included in a general nuclear law, consideration has to be given to their effectiveness. In practice, it is not easy to measure the effectiveness of key concepts deriving either from nuclear law principles or from general legal categories since their application goes beyond compliance with simple legislative obligations. This is perfectly illustrated by the use of the expression “safety culture”, the effectiveness of which is tested by reference to numerous criteria.

If the principles of nuclear law were justiciable, this could be considered as proof of their effectiveness, but it is not obvious that they are so. There are precedents in the United States and in the United Kingdom where a failure to comply with the principle of optimisation was held to be a breach of a duty of care. However, in France, although administrative tribunals seem to recognise indirectly the existence of the principle of precaution, they are much more cautious with regard to controlling internal legality where only a clear error of appreciation might justify the annulment of a decision (*Conseil d’État*, 28 July 1999, Intercommunal Association *Morbihan sous très haute tension et autres*) and even more so for the control of external legality, recognising a veritable obligation of precaution but condemning an excess thereof (*Conseil d’État*, 28 February 1997, *WF – Genève et autres*).

It could at first sight be thought easier to determine the effectiveness of key concepts deriving from general legal categories since procedures relating to licensing, control, inspection, emergency preventive measures or the setting up of financial guarantee systems are usually based on relatively detailed provisions. However, assessing the effectiveness of such measures depends on qualitative elements which cannot be evaluated through a simple verification of data.

For example, in the field of radiation protection, while it is true that data on ionising radiation doses constitute an indicator of performance, other factors come into play in assessing to what extent the installations or activities in question comply with safety and optimisation imperatives. On this topic, reference may be made to the elements envisaged by the United Kingdom Health and Safety Executive (HSE) to assess the safety of a nuclear installation and which refer to the need to reduce doses received to the lowest reasonably achievable level.<sup>33</sup> At the end of the day, the decision as to the nature of reasonably achievable measures remains subjective and subject to non-qualitative criteria. Similarly, where a licence is required, the licensing conditions often include requirements which are difficult to evaluate: thus, under the Swiss Act [Section 7], the granting of a licence to handle nuclear materials is subject to the requirement that “the protection of man and the environment as well as nuclear materials and safety are ensured”.

While the use of procedures for licensing or monitoring doses should enable more general principles such as safety to be transposed into legal terms, the presence of very broad conditions governing the granting of licences or the exercise of control shows that measuring the effectiveness of

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33. Five criteria are examined: a person must not receive doses of ionising radiation in excess of the statutory dose limits for normal operation; the level of exposure of any person to radiation must be as low as reasonably achievable; the effective collective dose received by operators and the public resulting from the operation of a nuclear installation must be as low as reasonably achievable; all reasonably achievable measures must be taken to prevent accidents; all reasonably achievable measures must be taken to limit the consequences of any radiological accident.

the key concepts included in a general nuclear law, whatever their nature, goes beyond compliance with legislative or regulatory requirements.

In order to judge the application of the key concepts contained in a general nuclear law, it therefore seems necessary to use criteria which are not easily quantifiable or verifiable. As regards safety, for example, reference is often made to “safety culture” which is “that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plant safety issues receive the attention warranted by their significance”.<sup>34</sup> Apart from criteria relating to the legislative framework governing the use of nuclear energy, two sets of criteria may be identified which make it possible to measure the effective application of measures of safety, a key concept of a general nuclear law.<sup>35</sup>

The first concerns the safety policy of an enterprise conducting activities using nuclear energy. Like the measures taken by the French operator EDF,<sup>36</sup> this could involve carrying out performance tests (for example, the boiler thermal balance which makes it possible to measure the power provided by the reactor), performing regular systematic maintenance tasks, or training all categories of personnel on the “safety” aspects of their work.

The second criteria essentially concerns individuals. The reason is that the human factor is often one of the causes of abnormal events. Thus, the IAEA safety recommendations<sup>37</sup> stress the values of awareness, commitment, motivation and responsibility on the part of operators, senior management and the authorities.<sup>38</sup> This, in turn, involves a constant readiness to review procedures, the proper dissemination of information, and good labour relations.

The effectiveness of key concepts which are included in general nuclear laws seems difficult to evaluate inasmuch as it involves factors which are not quantifiable and not easily enforceable by regulation. This dichotomy between quantifiable criteria and criteria based on behaviour not regulated by the law, suggests that the effectiveness of the key concepts in a nuclear law depends on both legal and non-legal conditions.

Among the legal conditions needed to give effect to the concepts contained in a nuclear law, two elements can be distinguished: the need for an effective regulatory system, and the adoption of appropriate legislation based on comprehensive evaluations of a country’s nuclear law and its application.

Positive law, laying down an enforceable general rule, is the principal instrument in mastering nuclear technology. It is therefore essential to ensure that the authorities have sufficient resources to implement the licensing and control procedures, emergency measures and coercive procedures in the

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34. International Nuclear Safety Advisory Group of the IAEA, Report 75-INSAG-4 “Safety Culture”, 1991, Vienna.
  35. Centre for Studies and Research in International Law and International Relations, *Les risques résultant de l’utilisation pacifique de l’énergie nucléaire*, International Academy of The Hague, Kluwer Academic Publishers, 1993, p. 68-74.
  36. 3<sup>rd</sup> French National Report, prepared for the 2005 review meeting, on the carrying out of the obligations under the National Safety Convention, p. 125.
  37. International Nuclear Safety Advisory Group of the IAEA, *op. cit.*
  38. These concerns are also reflected in Article 12 of the Safety Convention: “Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation”.

event of a failure to apply the rule. Apart from budgetary considerations, from a legal viewpoint, this means that such bodies must have sufficient authority and that their decisions are “binding on all natural and legal entities and shall be implemented strictly within the established time limits and in accordance with the prescribed procedure”.<sup>39</sup>

Over and above the efficiency of the regulatory system, if the key concepts contained in a general nuclear law are to be effective, the laws and regulations adopted in the nuclear field must be appropriate for nuclear activities and updated in light of the scientific knowledge and the experience acquired at international level. Provision to this effect has been introduced by some countries<sup>40</sup> in their general domestic legislation governing nuclear energy, and is also present in international instruments such as the Physical Protection Convention.<sup>41</sup> In practice, states may have recourse to external evaluations independent of their legislation, and also take advantage of the practices adopted in other countries by a system of peer review, as provided for in particular by the Safety Convention and the Joint Convention.

States may follow the recommendations of the IAEA as set out in the Safety Series, and also ask the Agency’s assistance in order to have an independent evaluation of their legislation in this field. Thus, for example, in the field of transport and safety, Transport Safety Appraisals are used to evaluate the application of the IAEA requirements and regulations in the field of transport and to make recommendations to the country being assessed with a view to improving its legal framework for regulating such activities. Moreover, with regard to nuclear emergencies, International Nuclear Emergency Exercises (INEX) have been organised in order to examine warning and communications procedures in the event of an emergency, as well as the countermeasures taken with regard to the import and export of foodstuffs. These exercises have, amongst other things, shown the participating countries the need to improve the co-ordination of information exchange techniques, monitoring arrangements and authorisation procedures for the import and export of food and goods.

It would seem that, in order to be fully effective and really help in ensuring compliance with the principles of nuclear law, the legal procedures consisting of licensing, control, notification and enforcement, must be evaluated at regular intervals and their implementation must be guaranteed by an efficient regulatory system. However, over and above these legal considerations, it seems necessary to promote the non-legal aspects. By incorporating a certain culture and attitude, individuals can accept and comply more readily with licensing and control procedures and with the fundamental principles of nuclear law because they understand the reasoning behind it. A particularly obvious example can be found in the field of safety. The development of a “safety culture” requires a commitment on the part of all the players involved.

In practice, senior managers in the nuclear industry are responsible for designing, constructing and operating installations, and also for setting up an organisational and relational framework conducive to the development of attitudes impregnated with the safety culture. This involves training staff, but also maintaining relations of trust and communication within the enterprise, and self-assessment. In this respect, as part of the assistance provided by the IAEA to countries, Operational

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39. Lithuanian Act, *op. cit.*, Section 13 dealing with the principles of the activities of state control and supervision bodies.

40. See Hungarian Act, *op. cit.*, Section 5.

See also the Ukrainian Act of 2005 on the Licensing of Activities in the Field of Nuclear Energy, Section 5, which specifies the need to take “a differential approach to different types of activity and radiation sources taking into account the potential nuclear and radiation hazard associated with them”.

41. Article 6: “States Parties shall take appropriate measures consistent with their national law (...)”.

Safety Review Teams (OSARTs) undertake a general examination of the safety culture in a given organisation, and have formulated a series of questions designed to encourage bodies to consider these matters themselves.<sup>42</sup>

This same safety culture must help establish a climate of trust between those being controlled, business, and the regulatory and control bodies. It is sometimes said that there is a “contractual”<sup>43</sup> element in the licensing procedure which operates together with the purely legal rules on safety. A practical example is the non-prescriptive approach adopted by certain monitoring bodies such as the Swedish Nuclear Energy Inspectorate (SKI), which helps establish a constructive dialogue and, hence, an easier and simpler implementation of the procedures and concepts contained in the nuclear law.

So, while it does not seem possible to measure the effectiveness of the two categories of key concepts likely to be contained in a general nuclear law, it seems necessary to guarantee their effectiveness. This requires a conjunction of legal conditions affecting the way in which the regulatory apparatus functions, and non-legal conditions which are designed to promote a climate of general trust.

Inasmuch as they relate to attitudes, these non-legal elements are difficult to regulate, although some countries have endeavoured to do so. One example is the 1996 Lithuanian Nuclear Energy Act, Chapter 13, which deals with labour relations in the sphere of nuclear energy.<sup>44</sup> This example illustrates the diversity of national approaches to regulating the peaceful uses of nuclear energy and thus the question of which key concepts should be included in a general nuclear law and how, has to be answered first and foremost by national legal and ethical policy.

#### ***B. The “national” choice of key concepts and their implementation***

The way in which the key concepts are included in a country’s general nuclear law, together with the necessary implementing procedures, depends on the characteristics of the country’s legal system as well as ethical and social considerations.

That choice will reflect the diversity of national legal traditions, which explains the particular difficulties which can be encountered in inserting concepts contained in international instruments.

In fact, even if a country considers certain concepts essential to regulate the peaceful uses of nuclear energy, it can choose to introduce them not in a general law, but in special legislation or other rules, depending on its legal traditions.

For example, in France, the key concepts of nuclear law were, from the outset, enshrined in various texts not specifically relating to nuclear law and forming part of France’s legal tradition of codification. Thus, the French monitoring of basic nuclear installations is based on the regulation of mines. Similarly, the transposition of four European Directives in the field of nuclear law<sup>45</sup> was effected by adding new articles to the Public Health Code<sup>46</sup> and the Labour Code.

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42. Carnino A., “Achievements in assessing safety culture”, in *Nuclear Law Bulletin* No. 52.

43. Patrick Reyners, quoted in the Centre for Studies and Research in International Law and International Relations Report, *op. cit.*, p. 71.

44. The provisions of this chapter include in particular restrictions on the conclusion of employment contracts [Section 70] and on industrial action [Section 73].

45. These are:

Beyond concerns to maintain the coherence of the legal system, certain authors have regretted the “scattering”<sup>47</sup> of relevant provisions in various non-nuclear laws, since this adversely affects the readability of the key concepts of nuclear law whereas adopting a single general nuclear law would have the advantage of expressly subjecting nuclear activities to these concepts. This criticism could, however, become a little less relevant in France, with the adoption of the bill on nuclear security and transparency which affirms the principles of radiation protection, and preventive and precautionary action, thus gathering together a large number of the key concepts of nuclear law.

National legal traditions affect not only the method of including the most important concepts in the national body of law, but also the procedures for their implementation. While certain countries share the same procedures for transposing concepts into law, the details of their implementation depend on the modes of action traditionally used by the public authorities in each country, and on national constitutional structures.

In France, although there is no general nuclear law reflecting the principle of participation of all players involved in nuclear activities, the Act of 30 July 2003 on technological and natural risks provides that everyone has the right to be informed, in the circumstances laid down by the act, about the risks of exposure to ionising radiation due to a nuclear activity. In practical terms, provision was made for the setting up of a high commission for transparency about nuclear security, the guarantor of access to information and of the principles laid down by the act with regard to information [Chapter 3 of Title II]. This type of body is characteristic of French policy, which makes considerable use of committees of “wise men” or independent administrative authorities to guarantee application of a right. The procedures by which the key concepts are implemented reflect not only the national administration’s modes of action but also the constitutional structure of the country concerned, especially when it is federal state. Thus, in Switzerland, a separate licence is required for each nuclear activity.<sup>48</sup> While the federal authorities are responsible for issuing licences and monitoring compliance, the cantons are consulted and associated with the process.<sup>49</sup> Similarly, the German Nuclear Act, as modified in 2002, details the responsibilities of the *Länder* [Section 24]. As far as nuclear liability is concerned, Section 36 provides for the burden of compensation to be shared between the *Bund* and the *Länder*.

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- Directive 86/618/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;
  - Directive 90/641/Euratom of 4 December 1990 on the operational protection of outside workers exposed to the risk of ionising radiation during their activities in controlled areas;
  - Directive 96/26/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation;
  - Directive 97/43/Euratom of 30 June 1997 on health protection of individuals against the dangers of ionising radiation in relation to medical exposure.
46. Public Health Code: Articles L 1333-1 to L 1333-20 and R 1333-1 to R 1333-93;  
Labour Code: Articles L 1237-1 and L 1237-2 and R 231-73 to R 231-116.
47. See Colson (J.P.), Schapira (J.P.), “*La gestion des déchets radioactifs et la nécessité d’une loi nucléaire en France*”, in *Revue juridique de l’environnement*, No. 3/1996, p. 247-260.
48. Each nuclear activity includes the handling and trading of nuclear materials [Sections 6 *et seq.* of the abovementioned Swiss Act], the construction and operation of a nuclear installation [Chapter 4, Sections 12 *et seq.*] or the carrying out of geological studies (Sections 35 *et seq.*).
49. Sections 44 and 47 of the abovementioned act.

The existence of different national legal systems explains the diversity of the ways in which key concepts recognised internationally have been incorporated into the legal regime of each country. This national specificity must be reconciled with international standardisation resulting from a country's accession to a binding nuclear law international convention or from its undertaking to comply with non-binding standards. In particular, as regards the incorporation of essential concepts contained in an international instrument, attention must be paid to their translation into the national language. Apart from the choice to be made between several interchangeable terms – for example, “licence”, “authorisation” or “permit” – when a direct translation does not exist, an equivalent concept or notion has to be found.<sup>50</sup>

Even if certain key concepts are repeatedly referred to at international level, the way in which they are inserted into the national legal system varies from one country to the next, as do the procedures for their implementation. To be included in nuclear legislation, these concepts must meet two conditions: they must be considered essential for the regulation of nuclear activities and be capable of incorporation into such legislation. If this second condition is to be met, their adoption by means of a nuclear law must correspond to national legal traditions.

For the first of the two conditions to be met, a policy decision must be taken, but, in view of the ethical problems involved in nuclear activities, the concept must have public support.

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The choice of the key concepts to be included in a domestic nuclear law, may sometimes be the result of a policy decision dictated by historical circumstances. An example of this is Japan's decision, following the Second World War, to include non-proliferation among the primordial principles for the uses of nuclear energy: Japan's three “nuclear principles” required it not to possess or produce nuclear weapons or to permit their presence on its territory.

Apart from historical reasons, the decision whether or not to include a given concept in a nuclear law depends on ethical considerations and on public preference, given the nature of the risks associated with nuclear energy and the long-term consequences of any decision as regards priorities or the transposition into law of these priorities. A good example is radioactive waste management.

The short and medium-term management of radioactive waste is organised in many countries by means of legal procedures requiring a licence to carry out geological studies,<sup>51</sup> and the obligation to ensure the safe management of waste storage or disposal facilities, which involves the control and regular monitoring of these facilities. However, over and above the technical aspects which may not be entirely mastered, the management of long-lived and/or high-level waste has an “ethical dimension the legitimacy of which is based on values considered by society as having priority”,<sup>52</sup> and which the lawmaker endeavours to transpose into law.

The difficulties which lawmakers encounter in “legislating for uncertainty”<sup>53</sup> show the importance of public debate and of consultative procedures which associate the public with

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50. Stoiber C., Baer A., Pelzer N., Tonhauser W., *Handbook on Nuclear Law*, IAEA, Vienna, 2003, p. 21.

51. Swiss Act, *op. cit.*, Sections 35 *et seq.*

52. See Colson (J.P.), Schapira (J.P.), *op. cit.*

53. *Ibid.*

decision-making. Once fundamental policy has been decided, it is ultimately up to the government to “define its contours”.<sup>54</sup>

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## Conclusion

The key concepts which ought to be included in legislation governing the peaceful uses of nuclear energy can be divided into two categories depending on whether they derive from the fundamental principles of nuclear law or reflect categories of general law. Their inclusion results in compliance with a shared obligation when they derive from a binding international instrument. It also permits the transposition into law of broader nuclear concepts and principles, and the more specific characteristics of a general nuclear law, which is to lay down priorities.

When the resulting classification is tested in reality, we can see that it is difficult to measure the effectiveness of the two concept categories inasmuch as this depends not only on quantifiable and controllable legal elements but also on non-legal behavioural factors, an obvious example of which is safety culture. Once the difficulties of defining a legal framework for nuclear activities and selecting the key concepts to guide them are known, the inclusion of a concept in a general nuclear law is determined by national legal and ethical considerations.

Thus, a general nuclear law should indicate the way in which the legal principles which reflect various prevailing ethical imperatives with regard to the environment, participation, and public interest, are applicable to the development of the peaceful uses of nuclear energy, having regard to the national specificities of each country and the particular nature of these activities. This means that there is a need to find original legal solutions reconciling the constraints of a specific law with the requirements of the ordinary law, i.e. the key concepts deriving from the principles of nuclear law. Given the possible reluctance of lawmakers<sup>55</sup> to commit themselves for the future by formulating detailed provisions valid over the long term, it has been suggested that a code of good practice<sup>56</sup> for the nuclear industry should be introduced which would go beyond the nuclear safety aspects, with the twofold advantage of supplementing the regulations with voluntarily accepted behavioural obligations, and meeting the ethical concerns raised by nuclear energy.

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54. Granet, “*Principe de précaution et risques d’origine nucléaire : quelle protection pour l’environnement ?*”, in *Journal du droit international*, No. 3, 2001.

55. Chapal P., “*Recherche sur la notion et le régime des actes juridiques à caractère prospectifs*” in *Actualité juridique de droit administratif*, June 1968.

56. Centre for Studies and Research in International Law and International Relations, *op. cit.*, p. 201. Mention should be made here of the good practice standards for the civil nuclear industry formulated by the International Nuclear Law Association.