FIFTH SESSION:

RADIOACTIVE WASTE MANAGEMENT

Long-Term Storage And Final Disposal Of Radioactive Waste

- Liability Aspects

By

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LONG-TERM STORAGE AND FINAL DISPOSAL OF RADIOACTIVE WASTE
- LIABILITY ASPECTS

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1 INTRODUCTION

Even at an early stage of the peaceful use of nuclear energy, much attention was given to questions relating to liability and compensation for damage arising in connection with the operation of nuclear installations. In most states where nuclear energy was used on an industrial scale national laws in this field were adopted. In the United States of America a liability and compensation system was created by the adoption of the Price-Anderson Act in 1957. Also in Western Europe national laws were elaborated in the 1950'ies and 1960'ies.

The problems related to liability for nuclear damage were also examined on an international scale. In the
latter part of the 1950's, work was initiated within the Organization for European Economic Cooperation (OEEC), now the Organization for Economic Cooperation and Development (OECD). This work lead to the adoption in 1960 of the Convention on Third Party Liability in the Field of Nuclear Energy (the Paris Convention). This Convention governs the civil liability of the operator of a nuclear installation for damage caused by the activities carried out in connection with his installation. The Paris Convention was supplemented, in 1963, by a convention on supplementary state liability, the Convention Supplementary to the Paris Convention on Third Party Liability in the Field of Nuclear Energy (the Brussels Supplementary Convention).

The purpose of the work carried out within the OECD was to create a regional regime on compensation for nuclear damage. Within the International Atomic Energy Agency (IAEA), which is a United Nations specialized Agency, a world-wide regime was established in 1963 by the adoption of the Convention on Civil Liability for Nuclear Damage (the Vienna Convention).

The Conventions mentioned above as well as the national legislation elaborated up till now have been drafted for the purpose of giving protection to victims of nuclear incidents arising in connection with the industrial use of nuclear energy. Problems related to damage caused by radioactive waste after disposal were not given any special attention, as questions connected with long-term disposal were hardly discussed in the late 50's and early 60's when the compensation regimes were established.
The purpose of this report is to discuss some of the major questions that will have to be answered before a regime on liability and compensation for damage resulting from long-term disposal of radioactive waste can be elaborated. As a background to this discussion, the report contains a brief description of the existing international regimes on liability and compensation for nuclear damage.

2 THE NUCLEAR CONVENTIONS

The object of the Paris Convention and the Vienna Convention was to establish a system providing compensation for victims of nuclear incidents in cases where the ordinary rules on civil liability were considered to be inadequate. These Conventions are built on the same principles, and also the individual provisions are to a very large extent identical in substance.

The Paris Convention and the Vienna Convention are based on the following four principles:

1. The operator of a nuclear installation is absolutely liable for any damage caused by a nuclear incident in his installation or involving nuclear material (including radioactive waste) in the course of transport from or to the installation.

2. The operator is also in principle exclusively liable for nuclear damage. This means that no person other than the operator can be held liable for nuclear damage. All liability is legally channelled to the operator, and he has a right of recourse only in a limited number of
precisely defined cases. Consequently, no liability will attach to suppliers or contractors of the operator who under ordinary law would be liable for such damage.

3. The liability of the operator is limited to a certain amount under the Paris Convention and may be so limited under the Vienna Convention. The Conventions give Contracting States a certain flexibility as regards the limitation amount. There is also a limitation as regards the period of time within which claims may be brought against the operator.

4. The operator is obliged to take out and maintain a financial guarantee, normally an insurance, corresponding to the amount of his limited liability as established by national legislation.

As for the prescriptive period, the right to compensation under the Conventions is extinguished if an action is not brought within ten years from the date of the nuclear incident. This period may be extended by the State where the installation is situated if financial security remains available. In the case of an incident caused by nuclear fuel or radioactive products or waste which, at the time of the incident, were stolen, lost, jettisoned or abandoned, the prescriptive period may in no case exceed twenty years from the date on which the operator liable lost control over these substances.

As already mentioned, the operator is obliged to take out and maintain insurance or other financial security corresponding to his liability up to the maximum amount applicable to him. In this regard, the channelling of all liability to the operator has the advantage that other
persons who might be liable under common law for damage arising from nuclear incidents will not have to take out a series of insurance policies.

Under any system where the liability is limited in amount, there is always the possibility that the aggregate amount of the damage resulting from a particular incident will exceed the limitation amount. When the Paris Convention was elaborated, it was recognized by the OECD countries that the limitation amount which could at that time reasonably be imposed on nuclear operators would not be sufficient to cover the damage that could arise out of a nuclear incident in all cases. For this reason, the signatories to the Paris Convention adopted in 1963 the Brussels Supplementary Convention. Under the Supplementary Convention the States are required to provide compensation out of public funds for nuclear damage beyond the amount of the operator's financial security up to a maximum amount of 120 million EMA units of account (approximately 130 million US dollars).1

The Supplementary Convention creates a system of compensation in three tiers. The first tier is covered by the operator's insurance or other financial security. The second tier is covered by the State where the

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1 European Monetary Agreement unit of account, defined in relation to the price of gold. This unit of account can be considered equal to a Special Drawing Right as defined by the International Monetary Fund (cf. footnote 2).
the nuclear operator liable is situated up to 70 million units of account. The third tier, for amounts between 70 million and 120 million units of account, is to be paid jointly by the States Parties to the Convention according to a formula based on the gross national product of the respective States and on the thermal power of the reactors situated in the territory of each Contracting State.

In 1982, Protocols amending the Paris Convention and the Supplementary Convention were opened for signature. The most important result of these Protocols is that the amounts laid down in the Supplementary Convention are considerably increased. Under the Protocol to the Supplementary Convention the second tier goes up to 175 million Special Drawing Rights. The third tier will then apply to amounts above 175 million SDR up to 300 million SDR.²

² The limitation amounts in the Paris Convention and the Supplementary Convention are at present expressed in a unit which is based on gold (the EMA unit of account). Due to the development that has taken place on the international monetary market, this method of expressing limits has in recent years been abandoned in many international Conventions. In the 1982 Protocols to the Paris Convention and the Supplementary Convention the limitation amounts are expressed in the Special Drawing Right (SDR) as defined by the International Monetary Fund. The relationship between the SDR and national currencies is determined on the basis of a basket of currencies (at present US dollars, Japanese yen, Pound sterling, French francs and German marks). A SDR is at present approximately 1.06 US dollars.
The Paris Convention entered into force in 1968. The Convention is at present in force as regards 14 States, Belgium, Denmark, the Federal Republic of Germany, Finland, France, Greece, Italy, the Netherlands, Norway, Portugal, Spain, Sweden, Turkey and the United Kingdom. The Brussels Supplementary Convention, which entered into force in 1974, has 10 Contracting Parties: Denmark, the Federal Republic of Germany, Finland, France, Italy, the Netherlands, Norway, Spain, Sweden and the United Kingdom.

The 1982 Protocols to the Paris Convention and the Supplementary Convention have so far been signed by 14 States. They have been ratified only by Sweden. The national legislation necessary for ratification of these Protocols has been adopted also in the United Kingdom. It is to be expected, therefore, that the United Kingdom will ratify the Protocols in the near future.

The Vienna Convention entered into force in 1977. There are at present 10 Contracting Parties to the Vienna Convention: Argentine, Bolivia, Egypt, the Philippines, Cameroon, Cuba, Niger, Peru, Trinidad and Tobago, and Yugoslavia.

3 DIFFERENT WAYS FOR DISPOSAL OF RADIOACTIVE WASTE

Radioactive waste may be disposed of in essentially three ways. It may be deliberately released into the environment, either in liquid or in gaseous form. It may be put into containers and dumped at sea. Finally, it may be buried underground, either as shallow land burial or in deep geologic formations.
The first of these methods, and to large extent also the second one, are based on the concept of the dilution or dispersion into the environment. It is essential, therefore, that the types of waste that may be disposed of by these methods are regulated closely, and that appropriate activity limits are established. This has been done at both national and international level, and the regulations are regularly reviewed and updated. Under these regulations, essentially only low level waste may be disposed of by these methods. The underlying idea is that there should be such a margin of safety that the chances of any significant damage being caused by waste disposed of in such a way are extremely low. In recent years there has, however, been criticism against any deliberate release of radioactive waste into the environment, in whatever way this is done. It has been argued that there is always a risk that the radioactive waste thus disposed of may cause damage to the environment.

These two methods will not be discussed further in this report. It should be noted, however, that there may arise difficult legal problems in case waste disposed of by any of these methods were to cause damage, e.g. the difficulty of proving causation.

The third method of disposal, burial underground, may be used for all types of waste, including high-level and/or long-lived waste. The basis on which operations of this type are carried out is isolation from the biosphere for the time required to allow the decay of radioactivity to harmless levels. Depending on various factors the waste will be buried at different depths. It may thus be
buried at or near the surface or in deep geologic formations.

In respect of waste buried underground which is potentially harmful for relatively short periods of time, it may be possible to envisage a continued surveillance on the site after the disposal as part of the security arrangements. Some of the waste disposed of by burial underground will, however, remain potentially harmful for very long periods of time, perhaps thousands of years. In such cases it's clear that the effective containment will depend on the barriers placed between the waste and the biosphere. It is thus conceivable that such waste may cause damage when an extremely long period of time has lapsed after disposal. This possibility gives rise to essential problems of application of the Nuclear Conventions to waste disposal.

4 APPLICABILITY OF THE NUCLEAR CONVENTIONS TO DISPOSAL OF RADIOACTIVE WASTE

The question that will have to be answered is whether the Nuclear Conventions apply to damage caused by incidents in connection with disposal of radioactive waste. If the answer is in the affirmative, it remains to be seen whether the Conventions provide solutions that are adequate from the point of view of the protection of potential victims or whether the Conventions should be modified as regards this special kind of nuclear incidents.

The Paris Convention does not contain a definition of the term "radioactive waste" proper, nor does the Vienna Convention. Article 1 (a) (iv) contains a definition of the
broader term "radioactive products or waste" which also falls under the definition of "nuclear substances" in Article 1 (a)(v). The Vienna Convention contains corresponding provisions. It may be assumed that the drafters of the Conventions were of the opinion that the question of whether a nuclear substance was to be regarded as a useful product or as waste would have to be answered on the basis of the circumstances in each particular case and in the light of the technological development. Furthermore, the Conventions do not define the terms "storage" and "disposal". The latter term does not even appear at all in the texts of the Conventions.

Under the Nuclear Conventions, liability rests with the operator of a particular nuclear installation. The operator is thus liable for damage caused by a nuclear incident involving either nuclear fuel or radioactive products or waste in his installation. He is also liable for damage caused by a nuclear incident involving nuclear substances (which include radioactive products or waste) coming from his installation. The operator's liability ceases, in the case of carriage of radioactive waste from his installation (including storage in the course of such carriage), after the operator of another nuclear installation situated in a Contracting Party to the Convention has assumed liability pursuant to the express terms of a contract in writing or has taken charge of the radioactive waste. His liability also ceases after the radioactive waste has been unloaded from the means of transport by which it has arrived in the territory of a non-Contracting State, where the radioactive waste has been sent to a person within such territory. It can also cease where, under national legislation, a carrier has
been substituted for the operator under the conditions laid down in the Conventions. Finally, the operator's liability ceases by extinction or prescription in accordance with the provisions of the Paris or Vienna Convention.

In the first two cases mentioned above it is necessary for the termination of the operator's liability that the radioactive waste is sent to the operator of another nuclear installation. The definition in the Conventions of the notion of "nuclear installation" is thus of fundamental importance. Under the Paris Convention, the term "nuclear installation" means:

- reactors (other than those comprised in any means of transport),
- factories for the manufacture or processing of nuclear substances,
- factories for the separation of isotopes of nuclear fuel,
- factories for the reprocessing of irradiated nuclear fuel,
- facilities for the storage of nuclear substances other than storage incidental to the carriage of such substances. ³

The question arises whether all installations for the disposal of radioactive waste are comprised in the definition of "nuclear installation" in the Conventions. It has to be established whether the expression

³ The definition of nuclear installation in the Vienna Convention is in substance identical.
"facilities for the storage of nuclear substances" used in the definition covers sites for long-term disposal. The negotiating history of the Paris Convention and the Vienna Convention (as reflected in the official documents) does not give any clear answer to this question. It appears that the drafters of the Conventions did not think of this problem, and for the valid reason that problems connected with long-term waste disposal where hardly discussed in the late 50'ies and early 60'ies.

It could be argued, therefore, that a person operating a waste disposal installation should not be considered as a operator of a nuclear installation within the meaning of the Nuclear Conventions. Such interpretation would have the result that the liability for any damage would fall on the operator of the last installation in which the radioactive waste was before the damage arose. As a consequence of this interpretation, the operator of the reactor from which the waste originated would be liable even after the waste had been received at the site for long-term disposal, in spite of the fact that this operator would have no influence on the handling of the waste.

As already mentioned, the liability of the operator also ceases by extinction or prescription. The liability ends if an action is not brought within ten years from the date of the nuclear incident. As regards long-term disposal of radioactive waste, this would mean that the operator will be liable for an extremely long period of time. As for the case of damage caused by a nuclear incident involving nuclear fuel or radioactive products
or waste there is, however, a special prescription period. If such fuel, products or waste, at the time of the incident, have been stolen, lost, jettisoned or abandoned and have not yet been recovered, the prescription period shall be computed from the date of that nuclear incident, but the period shall in no case exceed twenty years from the date of the theft, loss, jettison or abandonment.

The question is whether the expression "jettison or abandonment" covers the deliberate act of disposal without the intention of retrieval. The wording of the provision itself ("and have not yet been recovered") could be interpreted to indicate that this is not the case. It should be noted that in the original text of the Explanatory Report (the Exposé des Motifs) to the Paris Convention, the case of nuclear substances which have been abandoned was illustrated by the example of the jettisoning of a cargo following a fire in the course of transport.

It appears, therefore, that long-term disposal operations could not be considered as falling under the concept of abandonment or jettison. Consequently, the main rule of prescription applies for such operations; the time limit for extinction of actions for compensation is thus ten years from the date of the nuclear incident.

5 COMPENSATION REGIME FOR WASTE DISPOSAL SITES

When discussing problems of civil liability and compensation in the context of underground disposal, it may be appropriate to distinguish two main phases. The first one
is the "active" or "operational phase" of waste disposal which lasts for as long as operations are continued on the site. The second one is the "passive" or "post-operational" phase which starts when operations are completed; the repository will then be sealed, and, at least after a certain period of time, the waste will no longer be the subject of surveillance.

5.1 The operational phase

It appears that, from the point of view of civil liability, the activities carried out at the disposal site during the operational phase are not significantly different from other stages in the nuclear fuel cycle already covered by the Nuclear Liability Conventions. The basic principles on which the international regimes are built seem to be appropriate also as regards damage caused by nuclear incidents resulting from the operations at the site during this phase. An examination of the provisions of the Nuclear Conventions carried out within the OECD Nuclear Energy Agency has shown that the application of the Paris Convention and the Supplementary Convention to damage resulting from the activities during the operational phase would not cause any major problems. There would nevertheless be a need for modifications or clarifications of some of the provisions of the Paris Convention. The most important of these relates to the concept of "nuclear installation".

As already mentioned, there is considerable doubt as to whether facilities for waste disposal are covered by the definition of "nuclear installation" in the Paris Convention. For this reason, a clarification on this point seems to be necessary. Under the Paris Convention, the
Steering Committee of the OECD Nuclear Energy Agency is competent to extend the definition of "nuclear installation" to installations other than those specifically mentioned in the Convention in which there are radioactive products or waste. The simplest way of removing this ambiguity seems to be by way of a decision of the Steering Committee that waste disposal facilities should be included in the definition of "nuclear installation".  

If such a decision were taken a waste repository would clearly be a nuclear installation for the purpose of the Paris Convention and the Supplementary Convention. The ordinary rules on prescription laid down in the Conventions would then apply to damage caused by incidents on sites for waste disposal. Consequently, the time limit for bringing actions for compensation will be ten years from the date of the nuclear incident. This would not present any problems as far as the operational phase is concerned when conditions are similar to those applying to the industrial operation of a reactor. As for incidents occurring during the operational phase, there would be no liability when ten years have lapsed from the end of that phase.

5.2 The post-operational phase

When examining what kind of liability system that would be most appropriate with regard to the post-operational phase, it appears that the general principles underlying

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4 The Vienna Convention does not give any corresponding possibility of extending the definition.
the present Nuclear Conventions could be taken as a starting point. It is submitted that objective liability, channeling of liability, state intervention and international solidarity are elements which should be included in a liability and compensation regime covering the post-operational phase. It is obvious, however, that there are certain problems which have to be solved in a way that differs from the solutions adopted for the operational phase. The major difficulty is the extremely long period of time during which certain types of waste remain potentially harmful.

The first question is to determine who should be the person liable during the post-operational phase. It appears that the State will be closely involved in the operations connected with long-term disposal of radioactive waste. For this reason, it seems logical that the State should be liable for damage arising out of incidents occurring during the post-operational phase. It is not excluded, however, that at least in some of the OECD member States repositories will be operated by legal entities which are separate from the State and which could involve private interests. In such a case, it could be questioned whether such legal entity should not also have some primary liability.

In case only the State were to be liable, it could perhaps be questioned whether there would be a need for any special third party liability system at all as regards incidents occurring during the post-operational phase. It could be argued that damage arising from such incidents should be compensated by the State in the same way as damage caused by natural disasters such as earthquakes or floods.
If a special system of third party liability were to be created for incidents occurring in the post-operational phase, a difficult problem would be that of prescription. It appears that the solutions laid down in the Paris and Vienna Conventions are not suitable in relation to the post-operational phase. In the first place, it would probably be very difficult, if not impossible, to establish the date of an incident occurring during the post-operational phase; the date of the incident is as already mentioned the decisive date under the Conventions. If the period of limitation were to run from the date of the incident, the operator of a disposal facility would be liable for a practically unlimited period of time after the closure of the facility. In addition, any damage occurring in this phase is likely to be progressive in nature, and the damage will probably not be discovered for a rather long period of time after the incident.

It could be argued that at least as regards the liability of the State, there should be no time limit for actions. If on the other hand some liability were to fall on an entity other than the State, it might be necessary to fix another date of departure for the calculation of the period of limitation applicable to the liability of that entity than the date of the incident. It is conceivable that in order to safeguard the interests of potential victims the prescriptive period should run from the date at which the person suffering damage had knowledge or ought reasonably to have known of both the damage and the operator liable.

A major problem under any system of liability for damage caused by an incident during the post-operational phase
would be the difficulty for the victim to prove the causal link between an incident at a particular disposal site and the damage. This is due to the fact that damage may manifest itself a great distance away from the disposal site. It is very difficult to see how this problem could be solved in a manner that is satisfactory from the point of view of the victims, unless some legal presumptions were introduced in the liability system.

Another question is whether there should be some kind of compulsory insurance. In case the State itself were to be directly liable obviously no insurance would be needed. But even if an entity other than the State were to be liable, it appears that as the State would have to be ultimately liable, compulsory insurance could be dispensed with altogether. It should be added that it would certainly be very difficult, perhaps even impossible, to create an insurance system which would cover damage sustained in a distant future.

In the discussions that have been carried out within the OECD Nuclear Energy Agency, there has been mentioned the possibility to create some sort of fund which should be used to compensate victims suffering damage resulting from waste in a repository. It is submitted, however, that this is no viable solution. It is certainly feasible and appropriate to have a fund to finance research and development relating to long-term disposal of radioactive waste as well as the establishment, operation and control of disposal sites; such a system has already been established in at least one country (Sweden). For these kinds of activities, the necessary costs can be predicted
with at least some accuracy. It would be impossible, however, to make any meaningful calculation of the amount of the damage which might arise out of an incident in the distant future, say in ten thousand years. In addition, it would be impossible to invest the assets of any such fund in a way which would guarantee that they would actually be available to compensate victims for an incident in a far-off future.