

## Nuclear energy and insurance

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## Nuclear energy and insurance<sup>1</sup>

by

H. W. FRANCIS

— II —

### Classes of Nuclear Insurance<sup>15</sup>

#### (i) Material Damage Insurance<sup>16</sup>

The operator knows only too well that having spent considerable sums of money on the erection and fuelling of a nuclear installation, much or all of this may be lost if there is a serious accident. Moreover, those providing the funds for this purpose will usually require their investment to be protected by insurance. Consequently, insurance must be made available caused by conventional perils, for example fire, lightning, explosion, impact by aircraft and, in suitable cases, such special hazards as riot and civil commotion, malicious damage, flood and earthquake.

In addition, provision has also to be made in respect of damage arising from the nuclear hazards involved. The first of these may be described as "excessive temperature within the nuclear reactor consequent upon a sudden uncontrolled unintentional and excessive increase or release of energy, or upon the

<sup>15</sup> Les assurances contre le risque nucléaire.

<sup>16</sup> L'assurance des dommages matériels.

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failure of the cooling system". Depending upon the circumstances, this could lead to partial or even total loss of the reactor from a fuel "melt down".

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A further consideration is the possibility of accidental radioactive contamination of the Insured's property on the site but outside the reactor itself, that is, all his property outside the external shield of the reactor and the primary circuit. In order to make the operator's protection as complete as possible, the policy may be so worded that cover includes additional costs of decontamination and isolation of contaminated parts.

It is considered essential that both nuclear and conventional perils should be insured in the one policy, particularly as regards the risk of damage to the installation itself. Insurers have no historically established named peril with which to express the nuclear cover they provide. The centre of a working reactor can operate in conditions of such great heat as to be tantamount to "fire". A reactor incident could arise from conditions which might technically be tantamount to an "explosion". Since both "fire" and "explosion" are two of the perils intended to provide conventional type protection, descriptive headings have had to be established to identify the nuclear perils, but clearly it could be most difficult after an event to decide with certainty just which peril operated first. Moreover, radioactivity may well prevent or hamper fire fighting or the carrying out of repairs to the plant. Therefore, cover for both types of peril by the same policy with the same Insurers is obviously most desirable.

The policy specification may describe the sums insured on the basis of a "blanket" amount for all buildings and contents, or they may be individually specified as in the case of an ordinary fire policy. If the blanket method is used, however, there must be a division between the reactor block and the ancillary and other buildings on the site. Nuclear fuel is always a separate item.

In most countries Insurers prefer to specify quite clearly the forms of damage or perils covered by the policy in addition to those that they specifically exclude, but in the U.S.A. and Canada Insurers may use a different form of policy giving what is sometimes termed "All Risks" cover, but this contains exclusion

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clauses resulting in a much more restricted form of cover than may appear at first sight.

The usual form of Material Damage policy issued to an operator in the United Kingdom provides a considerable measure of protection for suppliers of goods or services to a nuclear installation. The Insured is required by the terms of his policy to agree, to the extent that he is entitled to be indemnified thereunder, that he will not claim indemnity from any person, regardless of fault, negligence or breach of any condition or warranty, in respect of damage to the Insured's property on the site caused by any radioactive contamination or by fire, explosion or excessive temperature each originating within the reactor, or with regard to damage to the reactor or associated buildings caused by fire, explosion or excessive temperature, however arising and wherever originating. For their part, Insurers undertake that they will not enforce any rights or seek from other parties any indemnity to which they would otherwise have been entitled. Similar provisions are generally found in the Pool Material Damage policies of other countries.

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This agreement is essential in order to maintain the principle of the channelling of liability in respect of a nuclear accident to the operator. If it were not done, then Insurers might accumulate underwriting liabilities arising from demands for nuclear insurance cover by many individuals or concerns not engaged in the production of nuclear energy, and they would thus be unable to control their maximum commitment. It is for similar reasons that conventional property insurances contain a Radioactive Contamination Exclusion Clause.

### (ii) **Machinery Breakdown Insurance** <sup>17</sup>

Limited cover is sometimes made available in respect of the breakdown of machinery or electrical installations even within what we call the High Radioactivity Zone of a nuclear reactor, but again this must be subject to the availability of insurance capacity after the requirements of the main Material Damage insurance have been met. Machinery Breakdown risks in the Low and Zero Radioactivity Zones of a nuclear installation are usual-

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<sup>17</sup> L'assurance contre le bris des machines.

ly covered by the conventional engineering insurance market, although the practice in different countries may vary somewhat in this respect.

Cover given by the nuclear Pools requires the listing of the machinery concerned with sums insured, a fixed limit on additional costs of access to the machinery in the event of breakdown and a substantial excess is imposed of up to £ 50,000 or 10% whichever is the greater.

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(iii) **Consequential Losses**<sup>18</sup>

In addition to the insurance of direct damage to the installation, the operators may require additional cover customarily available to industry in respect of conventional property, but whether such additional insurances can be granted depends essentially upon the availability of insurance capacity which has to be strictly limited in order that Insurers participating in such insurances can establish quite clearly their net commitments on each nuclear installation.

The losses of an industrialist whose premises are destroyed by fire extend beyond the cost of repairs, and the concept of consequential loss insurance applies equally to accidents at a nuclear power station as to accidents in conventional power stations which result in interruption of the electricity output. An accident resulting in the shutting down of a reactor may result in heavy consequential losses. There is the interruption of the electricity output pending repair of the damage and decontamination of the premises, and there may well be delay in making the repairs by reason of the radioactive contamination. Consequently, there may also be delay in obtaining replacement of parts, particularly where there is damage to precision and scientific instruments and specialist plant and materials. Cover for such financial losses is, in principle, available, subject to sufficient insurance capacity remaining after the Material Damage insurance requirements have been met.

Where a power reactor is concerned, the objective would be to devise a basis of cover sufficient to meet at least all the

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<sup>18</sup> L'assurance contre les pertes d'exploitation.

“fixed expenses” with which the operator has to contend, even though for the time being the reactor is shut down and the proceeds from the sale of electricity are no longer available. The actual form of policy would be similar to that written in the national Market concerned for comparable conventional risks, subject to such modifications as may be necessary when dealing with a nuclear installation. In conformity with conventional practice, the consequential loss policy would require the underlying Material Damage policy to cover the same range of perils, and it would be customary to establish an appropriate indemnity period subject to a franchise of a suitable initial period. If required, and again subject to available capacity, consequential loss cover could be drawn up to include within its scope the loss of the net profit element in addition to standing charges.

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The extent to which in the event of a stoppage the installation operator would be able to bring into operation less efficient generating stations, although at a correspondingly higher cost than normal, would be for examination as well as, for example, the possibility of purchasing electricity from other sources. The basis of rating would normally be a percentage of a reactor rate charged for the Material Damage policy and the term of the indemnity period would be significant.

I have to admit, however, that the number of consequential loss or business interruption insurances written in respect of nuclear power stations is extremely small, basically on account of capacity difficulties and lack of demand due to premium considerations. Moreover, some markets prefer not to give this type of insurance. However, it is likely to be more freely written in respect of other types of nuclear installation, particularly fuel manufacturing or reprocessing plants.

(iv) **Construction Risks**<sup>19</sup>

The practice in most countries, though not in all, is for the construction risk to be covered on an all risks basis in the conventional insurance Market, but at the time of fuel loading insurance in respect of the reactor block is effected for nuclear and conventional perils with the national Pool, and the scope of

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<sup>19</sup> L'assurance contre les risques de construction.

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cover under the Contractors All Risks insurance is reduced accordingly. In some countries, however, the national Pool will cover the construction risks ab initio.

### (v) **Liability Insurance** <sup>20</sup>

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Typical policies covering the third party liability of a nuclear operator usually provide cover also for purely conventional Liability risks, and it is considered essential for this non-nuclear liability to be covered by the same Insurers as those providing cover for the nuclear risks. Broadly speaking, the first part of the policy covers the operator's liability under his domestic nuclear legislation. Where damage caused by a conventional occurrence is not reasonably separable from that caused by a nuclear incident, such damage is considered to be damage caused by the nuclear incident. Under the international Conventions, contracting States have the option of giving employees exactly the same legal protection as third parties and, therefore, in many countries the domestic nuclear legislation makes no distinction with respect to an operator's own employees. Accordingly, cover must be provided by an insurance covering the operator for both employees and third parties unless the domestic nuclear legislation provides otherwise. It is the practice for that section of the Liability policy providing non-nuclear cover in respect of accidents on the site, for the Insured to select a separate limit of liability. The policy will also cover legal costs up to a limit of, say, 10% in respect of claims falling to be dealt with under the nuclear section of the policy, although costs in respect of the conventional non-nuclear cover are usually included for an unlimited amount as is usual for conventional third party insurance.

### (vi) **Contingent Liabilities of Suppliers of goods and services** <sup>21</sup>

Another form of insurance for which a demand is sometimes encountered is in the field of contingent liabilities. Outside nuclear insurance there are many forms of additional indemnity cover which may be granted to concerns or persons who have, or

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<sup>20</sup> L'assurance de responsabilité.

<sup>21</sup> Assurance contre la responsabilité des fournisseurs et pourvoyeurs de services.

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might have, a legal liability in connection with any accident at an insured establishment which causes injury or damage to third parties. For example, the liability of suppliers or manufacturers for their products or services, or persons providing professional consultancy services such as insurance brokers or civil engineers. Under the Conventions, liability for "off site" nuclear hurt or damage is channelled to the operator of the installation, and in general it is the intention of the Convention type nuclear legislation everywhere to concentrate upon the operator all liability to third parties including that of the suppliers and advisers who are thus protected in a contracting State. Moreover, it would seem that this protection also applies to damage which may be caused to the reactor itself or to property on the site used in connection with the operation of the installation or for the purposes of its construction; but for this provision, suppliers might well be liable under an action for negligence. Circumstances might arise, however, which would leave suppliers of goods or services exposed to certain claims as, for example, in respect of components supplied for reactors in non-contracting States. Considerable costs may be incurred in defending a third party claim brought against a supplier even although this might be a bad claim in law.

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One of the problems facing Insurers in connection with requests for contingent liability covers of the kind described is the question of accumulation of liabilities in respect of a particular site where the operator's own liabilities are insured or may be insured by the national nuclear Pool. For example, it could happen that a supplier of products would not necessarily know in which of the nuclear installations his goods were being used. Consequently, Insurers may find themselves involved not only in the operator's Liability insurance, but could also be facing additional claims through some form of contingent liability insurance. Accordingly, such policies normally have a very much lower limit of indemnity than that maintained for the operator's own Liability requirements in order that Insurers may keep their potential overall commitments in relation to each installation within reasonable bounds.



(vii) **Transport Risks** <sup>22</sup>

The insurance of nuclear material in transit is a class of risk often handled by nuclear Pools although in some countries it is underwritten by specialist marine insurers. Similarly, the insurance of nuclear propelled ships is also usually handled by the traditional marine insurance market.

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The Paris Convention provides that the third party liability in respect of nuclear material in transit shall be the responsibility of the operator from or to whose installation the nuclear material has come or is going, and insurance cover is effected accordingly. Certain States, however, require transits within their own frontiers to be insured for either higher amounts or by their own national Insurers, and this gives rise to undesirable insurance complications which add to the cost of transit. The problems involved are at present the subject of study by both Government experts and Insurers, and so I cannot go into the matter further at this time.

**Nuclear Reactor Hazards and their Assessment** <sup>23</sup>

The main hazard associated with nuclear reactors can be summarised as follows:

- (a) "Runaway", i.e. overshoot of power caused by lack of control of the nuclear reaction resulting in a possible "melt" of the fuel elements and consequent release of fission products.
- (b) Overheating, which may be caused by a variety of reasons such as excessive power, loss of coolant, obstruction of the cooling circuits, and which may be widespread or localised in position.
- (c) Explosion, which might arise through
  - (i) a build-up of pressure;
  - (ii) chemical reaction where incompatible substances are brought together.
- (d) Possible changes in the qualities of materials used in the reactor and circuits due to long-continued radioactive bombardment.

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<sup>22</sup> Assurance contre les risques de transport.

<sup>23</sup> Les risques du réacteur nucléaire.

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- (e) Breakdown of the reactor structure from any cause which may result in the uncontrolled emission of fission products to the atmosphere.

In order that insurers may be able to assess the risks they are being asked to undertake, they require full technical and underwriting information. This would include:

- (i) Type of installation and, if a reactor, its design, thermal capacity and use,
- (ii) Nature of nuclear fuel and, if relevant, moderator, coolant or heat transfer medium,
- (iii) Control mechanism and safety monitoring equipment,
- (iv) Safety margins allowed in containment design,
- (v) Geographical situation and prevailing weather conditions,
- (vi) Operating safety code and training and discipline of operators,
- (vii) Fire protection.

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These considerations apply basically to the assessment of Material Damage risks but are equally relevant to a consideration of Liability risks. In the case of the latter, further matters have to be taken into account such as the nature and value of the property in the vicinity, the concentration of population, the direction and strength of the prevailing wind and the extent to which rivers, lakes or seas may be affected by the release of radioactive effluents.

### **Future Developments** <sup>24</sup>

It will be apparent from what has been said that Insurers have made very special efforts to meet the demands of this relatively new and challenging field of nuclear energy. International collaboration has been and continues to be worldwide. The British Pool, for example, has already been consulted on nuclear insurance matters in respect of some forty different countries spread over all five continents, and is currently co-operating in technical studies designed to improve fire protection in nuclear installations. Here I would make reference to the "International Guidelines" for the Fire Protection of Nuclear Power Plants which were issued in 1974, and which have become a widely

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<sup>24</sup> L'avenir des réacteurs nucléaires.

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accepted standard for the fire protection of such stations. All the existing nuclear insurance Pools are, I am quite sure, ready to make their experience and expertise available to similar Pools which may be established in the future in other countries when the use of nuclear power for peaceful purposes increases. The building of new power reactors is proceeding apace as will be clear when I tell you that the number of such stations in December 1975 was 121 and is expected to increase by 1980 to 222. These developments are being accompanied by an increase in the size and electrical output of the new stations, and this in itself provides a challenge to the nuclear insurance business to provide the capacity for the very greatly increased values concerned.

Not only is there this increase in the value of the material assets, but the capacity question is now also arising in respect of the greatly increased limits of liability being imposed by some countries in respect of the liability of operators. In 1975, for example, the renewed Price Anderson legislation in U.S.A. required operators to provide insurance for U.S. \$125M, while all operators must contribute on a contingent basis to a second layer in excess of that amount up to U.S. \$560M by means of an assessment per reactor per operator. Similarly, in Germany we have the situation that insurance cover may be required up to DM.200M with the operators being responsible in excess of DM.200M up to DM.500M and the Government being responsible for a further DM.500M. Canada has a somewhat similar legislative requirement. Other countries have revised their legislation in recent months, often doubling their existing liability limits.

Whilst I am sure that the Insurers through their national Pools will seek to meet the new requirements imposed upon the operators, it is clear that the capacity problem is one which will cause Insurers considerable thought for a long while to come. They must take increasing interest in the protection of nuclear installations, not only in respect of the nuclear risk but also in regard to the protection against conventional perils such as fire, explosion, etc. This is one positive way in which the Pools can seek to help provide the necessary worldwide capacity, and I am sure that the nuclear industry can rest assured that Insurers will do their utmost to provide the cover that is necessary.

We have come a long way in nuclear insurance since the 1950's and experience has so far been better than we dared expect. In broad terms we have not had the large number of partial losses we might

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have expected on the basis of conventional insurance experience, and moreover we have been fortunate in that several major fires and nuclear accidents costing millions of pounds have not been insured by the nuclear Pools at the time of the occurrence, but one cannot escape the fact that if there is a really serious nuclear accident within the reactor block of a nuclear power station the loss is likely to be catastrophic. Moreover, nuclear Insurers cannot but face the fact that a serious Liability claim is almost certainly likely to be accompanied by a huge Material Damage loss.

Additionally, we have to recognise that whilst the spread of risk is growing, so also are insurance exposures, and new forms of reactors are being developed. Therefore, premium levels have to be maintained, notwithstanding the strong pressure from operators and brokers, and the fact is that we are still not in a position to say whether our premiums are adequate or not. We shall only know this with longer experience, and in the meantime Insurers must endeavour to meet the requirements of nuclear operators as fully and reasonably as possible. This, I suggest, they can only do on the basis of the worldwide chain of "nett line" Pools which has been established, and which continues to grow with the passing of the years.

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### **The Review, International Insurance Intelligence — December 3rd 1976.**

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