
Risk Cover for Nuclear Power Stations

On April 26th, 1986, reactor block 4 at the Chernobyl nuclear power plant exploded. The accident resulted in release of large amounts of radiation to the environment, a level 7 event on the IAEA scale. The victims of the accident have not been adequately compensated; insurance cover did not exist.

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31 people dead as a result of explosion and direct radiation, 134 diagnosed as suffering from acute radiation sickness, more than 100,000 people relocated, 1000 children suffering from thyroid cancer, 800,000 people (liquidators) involved in collecting radioactive material, 200,000 of them receiving five times the annual maximum permitted radiation dose, and smaller numbers receiving over 100 times the limit, 3000 sq.km evacuated permanently:- these are some of the „statistics" taken from an International Atomic Energy Agency report of a level 7 (IAEA scale) nuclear accident at Chernobyl in 1986.

A major anomaly has been allowed to arise in connection with nuclear power in that currently major accidents in any country, above level 5 on the IAEA Event Scale, are not covered by insurance, i.e. the risks associated with any accident of this magnitude are not assumed by the operators or anybody else for that matter. Most of the consequences resulting from a serious accident would have to be borne by the victims.

This situation arose when nuclear power began to be utilised on a commercial scale, and it has persisted right up to the present. Decisions to build nuclear stations were taken at a time when fossil fuel prices were very volatile and supplies threatened. The need to achieve diversification of energy sources and public confidence in technological progress created a situation where nuclear power achieved a broad consensus of acceptability.

Major accident insurance was not put in place for two reasons:

Firstly: the industry claimed that the sums which could arise in damages and compensation were so large - of the order of 10^{12} US dollars for any one event - that the risk could not be covered by any conventional insurance mechanism. Secondly: it was argued by the industry that the necessity of having such an insurance did not arise because the statistical risk of a major accident was so small that it could be ignored. It is time to re-evaluate this situation. In assessing damages resulting from a major nuclear accident, the siting of the station is of major consequence. It is necessary to count the loss of life or exposure to severe radiation doses as affecting up to at least 100,000 people (130,000 people received significant radiation doses as a result of the Chernobyl accident) together with providing support for family members and health care over a very prolonged period. As well as that, the value of an area of land of at least 20 by 50 km, the cost of permanent evacuation and resettlement of perhaps up to one million people, the cost of up to one million homes, other property damage and the economic loss associated with goods not being usable because of fall-out all have to be taken into account.

Risk assessment studies of complex systems involving interaction between the human element and process equipment/control elements are not only extremely difficult, reliable predictive models are impossible to compile as knowledge of all future states of the world and combinations of events are impossible to obtain for obvious reasons. The accident at

Chernobyl, occurring approx. 15 years after the nuclear power industry commenced large-scale commercial operation, is evidence that even though the risk of a major accident may be statistically quite small, it is not zero and thus cannot be ignored completely. This is underlined by the fact that it is recognised, even by the industry, that many stations in operation, particularly in the former Soviet Union and Eastern Block countries, exhibit major design deficiencies and some lack even basic safety features.

There are 13 Chernobyl-type reactors still in operation and a further 11 stations of the first generation pressurised water VER-440/230 type also in operation, all of which have inherent above-average risk potential. The latter were designed before formal safety procedures came into force in what was then the Soviet Union.

Currently, the maximum level of cover in existence is for accidents up to and including level 5 events on the IAEA Event scale, this applies in the USA only, most other countries have cover far below this level, the operators themselves carrying very little or no cover. What cover there is has to be assumed in large measure by the State, with the victims of an accident having to rely on the munificence or perhaps the ability of the Government to meet the costs. Not even the US, backed by massive State resources, has cover for level 6 or 7 accidents. It may be noted that the Three Mile Island accident, a level 5 accident, though contained, still cost one billion dollars to clean up. The cover provided in some of the major producing countries is shown in the following table:

Insurance Cover for third Party Liability in Case of a nuclear accident

Country	Liability of nuclear operator or State (Mill \$)	Insurance Coverage (Mill \$)(Exchange rates: Jan.22nd 1989)
United Kingdom	8 to 33 State liability: 420	8 to 33
United States	7,000	200 + up to 7000 retrospective premiums of the 111 nuclear power plant operators, but not more than 63 per reactor 10 per incident and year
Japan	Unlimited	263
France	106 State liability: 441	106
Germany	Unlimited	0.58/MWe + 3.0 for the first MWe up to 296, of which 178 is provided by a contract jointly subscribed to by all nuclear power plant operators

Source: Nuclear Energy Agency: Third Party Liability. OECD: Paris 1990

International Agreements

European countries are party to the Paris Agreement of 1960 and to the Brussels Supplementary Convention of 1963 under the auspices of the then OEEC/Nuclear Energy Agency (NEA). These Conventions provide for coverage of cross-border damages claimed within ten years. Negotiations on revising the Paris Agreement began in 1989.

The Vienna Agreement was adopted in 1963. The aim was to establish rules which would be applicable world-wide.

At a conference in September 1997, delegates from 80 countries agreed a Protocol to amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage and also the Convention on Supplementary Compensation. The Protocol and Convention have not yet entered into force. Upwards of 15 States, many having no nuclear power program, have signed one or both instruments.

The currently valid Brussels Supplementary Convention together with the Paris Convention provides for a three tier compensation of 420 million \$. The first tier is covered by the operator's insurance with a minimum of 7 million \$, 21 million \$ being more the rule. The second tier is provided by the Contracting State in whose territory the nuclear power operator is located, with 245 million \$. A further approx. 175 million \$ are provided by the Contracting States jointly, according to a formula based 50% on thermal power of the reactors and 50% on gross national product. In as far as compensation for victims does not give rise to any appreciable costs for operators, there is no incentive arising from this to reduce output of nuclear energy. This applies in particular to any compensation paid by the State.

Compensation paid by deferred premiums in the United States as well as joint subscriptions of nuclear plant operators in Germany begin to become an incentive to reduce nuclear energy output only after an accident has occurred. Indemnity from liability for nuclear damage as well as lack of insurance coverage for same must be considered as subsidies to the nuclear industry.

The following proposal is aimed at providing a more equitable means of compensation for individuals affected by radioactivity resulting from a major accident.

The proposal envisages a charge of 1 c US per kWh being levied on the output of all nuclear plants world-wide. The 1997 electrical energy output of all nuclear plants amounted to approx. 2,276 Terawatt hours (2.276×10^{12} kWh), produced in 437 plants. The charge would result in a sum of two hundred billion dollars, about 2% of the US gross domestic product, accumulating over ten years.

Based on the experience of Chernobyl, this money would go a long way to cover for loss of life, personal injuries, damage to property and other costs associated with a level 6 or 7 accident. Depending on the location involved, it might be sufficient in itself to meet most or all claims.

The "polluter-must-pay" principle, stipulating that producers and ultimately consumers bear all costs associated with producing goods or providing services, has proven to be an effective instrument in allocating resources and creating wealth. There is no reason why it should not apply to nuclear energy.

Such an insurance charge as is proposed will lead to thinly populated regions being favoured as sites for new power plants to minimise damage in the event of an accident. It may be envisaged that the amount of cover assigned to any one station will be differentiated to reflect the local conditions prevailing at the particular location in terms of potential damage occurring in the event of a major accident. In addition, it will result in a uniformly high level of design and operational procedures being applied in all countries, in stark contrast to the present situation.

Furthermore, it should lead to the establishment of an independent Inspectorate, something which does not exist at present. The charge on the industry will accelerate the search process, giving rise to more innovative technology, incorporating changes in design philosophy which will promote safety and a better image of an industry and technology, now viewed very sceptically by the public-at-large.

Due to the magnitude of the undertaking and on the basis of evidence to-date, it cannot be expected that this problem will be amenable to an individual or even a national solution.

Therefore, it seems reasonable to approach the issue on the basis of the Paris and Vienna Conventions which have meantime in one form or another been adopted by more than 80 countries. In the context of the Vienna Convention, Member States could oblige operators of nuclear facilities to contribute to such a fund, thus creating the international insurance within this framework.

The proposal should be welcomed both by proponents and opponents of nuclear energy. Proponents should appreciate that the credibility of the nuclear industry would only be enhanced by a more honest appraisal and readiness to concede that accidents are possible (in addition to Chernobyl and Three Mile Island, the Windscale UK incident of 1957 counts as a level 5 accident and the St. Laurent, France, accident of 1980 as a level 4 accident). In approximately 8500 reactor years of operation, the safety record is not exactly the equivalent of zero accidents.

Opponents of nuclear energy could welcome the allocative effects described above, the increase in prices which should lead to a reduction in consumption of nuclear-based energy and a more equitable distribution of the ultimate costs.

Barely a week goes by without some controversy associated with nuclear power making the news. The inability of the industry to answer its critics and establish credibility is a cause for serious concern - especially for those doubtful on how the environment will bear the strains of ever increasing greenhouse gas emissions from fossil fuel stations.

Moreover, a willingness to assume the risks of compensating people affected by an accident would reflect a change of attitude which is currently seen as dismissive and remote, this one particular industry setting itself apart from all others. Adequate insurance cover needs to be an element of normality, for all industries, and most especially for one capable of causing unprecedented devastation.

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