

ROLE OF PROBABILISTIC EVENTS IN THE APPLICATION OF THE JUSTIFICATION CRITERION

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ABSTRACT

Probabilistic events (potential accidents) at large industrial installations - specifically nuclear power plants - play a major role in the public debate. According to the IAEA (ICRP) criteria an installation is only justified if it results in a net benefit for the society. It is logical and in accord with the importance assigned by public opinion that probabilistic events be included in a justification evaluation.

This also entails an assessment of the probability of occurrence and the consequences of such events. As regards the consequences, however, one has to keep in mind that the impact on a given society not only depends, for example, on an absolute number of casualties but also to a great extent on the fraction of the population involved: a hundred casualties equally distributed over 100 towns is different from 100 casualties in one town.

For the application of the optimization criterion it has been recommended that a beta factor be used to describe the more than linear increase in risk aversion which occurs as the level of risk to a single individual increases.

The application of this basic concept for the evaluation of a societal risk caused by probabilistic events may be even more useful than its application in the optimization process. In addition, the ability of a society to heal a limited amount of harm and inversely the decrease in this ability when an increasing fraction of the society is involved could be included in this factor.

It has to be kept in mind that an individual has a limited life expectancy. Therefore even the worst case causes only a shift in that value. A society, however, usually wishes to be "immortal" and will therefore have a higher aversion to any risk which may threaten this desired immortality.

Such a beta factor will therefore approach large values if a large fraction of a given society would be injured by an accident or even if it would only be forced to leave its homeland. This effect will have to be offset by a corresponding decrease in the probability of occurrence of such events.

A beta factor depending upon the fraction of a society affected by an accident can therefore vary, depending on whether the consequences of such an event are being considered, for example, by the authorities of a town adjacent to a plant or by a central government.

The paper addresses potential applications of this methodology as well as some of the problems which may be encountered.