ETHICAL ASPECTS ON NUCLEAR WASTE

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ABSTRACT

In an ethical assessment of how we shall deal with nuclear waste, one of the chief questions that arises is how to initiate action while at the same time taking into consideration uncertainties which are unavoidable seen from a long-term perspective.

By means of different formulations and by proceeding from various starting-points, a two edged objective is established vis-a-vis repository facilities: Safety in operation combined with repairability, with controls not necessary, but not impossible. Prerequisites for the realization of this objective are the continued advancement of knowledge and refinement of the qualifications required to deal with nuclear waste.

The ethical considerations above could be the bases for the future legislation in the field of nuclear energy waste.

INTRODUCTION

The fundamental dilemma which surrounds taking an ethical stand on this problem is defined as a crisis of tension between, on the one hand, our knowledge of the long-term effects of nuclear waste, and the other, our awareness of the fact that the vast chronological perspective of nuclear waste's longevity gives rise to uncertainty in our assessment of its practical consequences. Our generation bears the responsibility for the long-term consequences as a result of our using nuclear power to create electricity; but at the same time, the longevity of the waste products makes us uncertain as to how well we discharge the very responsibility that we have shouldered.

The Swedish Consultative Committee for Nuclear Waste Management (KASAM) with the intention of widening and developing this discussion in collaboration with the National Board for Spent Nuclear Fuel arranged a seminar in 1987, that encompassed several scientific lines of inquiry. About 50 scientists were invited to take part especially those with backgrounds in the humanities, theology, the natural sciences and technology.

The seminar confirmed that as soon as we look at nuclear power from the perspective of its waste products regardless of how we may continue to use nuclear power, it is both correct and constructive to formulate the fundamental query in terms of "Ethical Action in the Face of Uncertainty". One important reason for this is that we know certain things about the vast chronological dimensions involved in dealing with nuclear waste. We know, for example, the length of the radioactive half-life of different types of nuclear wastes. Therefore, there is an unique and obvious connection between any measures we may take today and their consequences far in the future, for the present and the future are clearly inseparable. Seen from the perspective of its wastes, nuclear power has revealed to us that our responsibility for it projects so far into the future that we, in fact, lack the ability to even imagine that future; and this means that we are forced to accept the factor of uncertainty in our assessment of the long-term consequences of our actions today.

It is important to point out that the long-time perspective is, nevertheless, not unique to nuclear energy. Indeed, the way in which we approach the question of how to cope with nuclear wastes ought to serve as a model for how we deal with other long-term consequences of "the breakneck progress of our generation, which has not only been bought at the cost of our own welfare, but also poses a threat to the health and environment of thousands of generations to come". Nuclear waste has been the first of these dangers to come under wide scrutiny due to a number of factors, not least among them the fact that the technology of nuclear energy is, in many people's minds, inseparable from the technology of nuclear weaponry.

In an ethical assessment of how we shall deal with nuclear wastes, one of the chief questions that arises is how to initiate action while at the same time taking into consideration uncertainties which are unavoidable seen from a long-term perspective.

DIFFERENT TYPES OF UNCERTAINTY

Since we are dealing with different types of uncertainty on this issue, it follows that we are also dealing with uncertainty in different dimensions of time: Human, societal, biological and geological. For society, a thousand years is a long time. but geologically speaking, 24 000 years - the half-life of plutonium - is an almost inconsequential time-span, however long it may seem in the biosphere.

In a way it is inappropriate to speak of man as being an uncertainty factor. In fact, man is an unusually well-functioning being, with a powerful potential for development. But at the same time, he has certain built-in limitations, certain imperfections; he is "inherently unfoolproof". Man often attempts to compensate for these innate limitations by technically improving the efficiency of his creations. He believes that with the "perfect" technical system he can thereby make the system itself impervious to human failure.

Each society has certain tendencies toward reproducing itself, the better to maintain its own stability. These tendencies are especially palpable in three specific societal manifestations: Firstly, in the transference of values and methods of instruction from primary groups of different types to the new generation (socialization). Within these groups a common mentality is fashioned, making it possible for us to predict the behavior of other people with a reasonable degree of certitude; secondly, in the judicial role of the State, i.e. its laws and the social control they exert. Thirdly, in the social network of economic activity, in which quite different protagonists behave quite similarly because they are steered by parallel interests.

The third type of uncertainty regards the development of our environment. We know that the very same scientific and technological progress which has had, in many ways, such a positive effect on mankind's living conditions has also subjected the environment to exploitation and has already caused discernible damage. Besides, if effective measures are not taken against these effects, we can predict even more threatening consequences, for example damage to the ozone layer and genetic abnormity in human and animal life. Both in the short-term perspective, which involves our lives today, and in the long-term perspective, which involves the "life" of nuclear waste, measures against damage and threats to the environment must take into account not only the present situation but the environment of future generations.

SYSTEMS THAT DIMINISH UNCERTAINTY

Two fundamental ideas are of primary importance to any final disposal system. Both of them have to do with the fact that any such system must be constructed with a high tolerance for error, i.e. that it can "pardon mistakes" by virtue of its own built-in security. One of these is the multi-barrier-principle, according to which the wastes would be surrounded by several barriers, none of which would be dependent in its function upon the others, in order to guarantee that the system's security would not be contingent on the function of any single barrier. In order to counteract the basic uncertainty which still arises in any analysis of the barrier's function (due to the long time-frame necessary to the experiment, which makes controlled testing of the barriers a practical impossibility), a second principle must complement the first: The repository must be constructed as a system in harmony with Nature. In other words, materials found in nature would be sought for construction, and the observations which can be gleaned from the natural world could be held up to comparison with various natural systems to arrive at "natural analogies".

RISK

Psychological studies demonstrated the ways in which human beings experience risk. One result of these studies is the observation that the risk-assessments of informed experts often differed radically from those of laymen. It is interesting to note that there are questions in which the experts assess the risks as being appreciably more innocuous than the general public believes, as well as questions in which laymen feel the risks to be far less than the experts do. As example of this are risks posed by nuclear waste as opposed to the dangers of fire, even though both of these are areas where relatively detailed information has been dispensed to the public. The results of the studies also show that there can be great differences in how risk is perceived among different groups in society depending on age, sex, level of education, etc.

The impression of the seminar was that the linear relation and the ALARA-principle are ethically acceptable guidelines. Similar guidelines should influence our attitude toward exposure to certain dangerous chemicals and other substances as well. Another general conclusion is that mankind should behave in such a way that the proliferation of radioactive and chemical substances on our planet be minimized.

It was emphasized that in order to minimize as much as possible the risk of long-term negative effects on the environment, we must seek to create systems that are closely allied to Nature itself. One of the seminar's participants formulated the following "commandments" as guidelines:

- Thou shalt not use substances that cannot be broken down in water.
- Thou shalt not employ processes that are unendurable for life as such.
- If that isn't feasible, then construct things in the best possible way. Think of Life in a way that keeps it holy.
- Do not abuse your knowledge or your techniques to harm Life.

The Shifting of Paradigms in Ethics

The deliberations made by the seminar as to what constitutes correct ethical action, considering the long-term consequences of such action and in the face of the uncertainty that characterizes it, seem to point to at least a partial shifting of ethical paradigms.

It is obvious that the ethical theory which goes under the heading "Ethics of Consequences" must be supplemented. The traditional criterion for the ethics of consequences, that an action is morally correct if it leads to consequences at least as good as other conceivable alternatives would have produced, is inadequate. Considering the long-term consequences of certain actions, we can never possibly know if those actions were correct. instead, we are forced to work with calculations of probability.

The difficulties inherent in foreseeing the long-term consequences of our actions and the uncertainty that follows in their wake, impart a new urgency to the need for ethical principles or basic norms. If we consider that the future consequences of our actions today will influence to a great degree the conditions of all future life, it would seem self-evident for us to seek basic norms in Nature's own modus operandi, and to ask ourselves whether there is indeed a biological ethic. Attempts were made to define such an ethic, and the seminar was unanimous in its conclusion that seeking these norms presents an important opportunity to arrive at substantial ethical principles for the protection of man and his living environment. In the long run, our responsibility can be summed up thus: " Do not burden Nature with more than she can bear!"

What we call natural ethics must, however, be supplemented by the ethical principles of the humanistic wordview, which allow not only for assumptions about the worth of mankind, but leave room as well for values fundamental to the lives of all men. The central theme in this context is the possibility for responsibility, observation and control. Here, the seminar emphasized time and again the question of what processes lead to decisions, and the problem posed by the fact that knowledge and information are unequally spread in our society. From the latter it can be deduced that the majority of people has not been given information in a form that is accessible to them, and thereby lack the tools for observation and democratic control. In many areas it should be possible to state, for example, exactly which facts are not subject to controversy, as opposed to facts on which knowledgeable opinions differ. It was also emphasized that as far as nuclear waste is concerned, the common base for factual knowledge is unnecessarily narrow, and that in this field a broadened dialogue is badly needed between experts, opinion-makers and the general public.

This is all the more important since we seem to be facing still another shifting of ethical paradigms. Western ethics have been traditionally dominated by rules for the actions of the individual. Furthermore, these rules have revolved around people's personal interests and needs. However, now that the horizons of responsibility are broadening to include the consequences of our actions for the condition of all life far into the future, the common responsibility which we bear collectively must occupy stage center as it never has before.

One conclusion stands out clearly: Ethical assessments must be arrived at through collaboration between people with different qualifications, experience, and spheres of responsibility. This collaboration must then function at each phase of the working-process that leads to finally taking the necessary stand. The ethical specialist's particular contribution to this collaboration can only be his exposition of problems and conflict-patterns in relation to established criteria for dealing with nuclear waste. But assessment of how these criteria are met must be arrived at by the concerted efforts of people representing many walks of life. Their assessment should, too, be openly accounted for as the basis for the stand which our generation must take. This is all the more important as the criteria, such as they have been set forth in previously-made political decisions, are and must be related to society's fundamental values as far as human life, health and safety are concerned, and applicable not only to coming generations but to the total environment as well.

A DOUBLE CONCLUSION

One of the central questions posed at the seminar concerned our generation's responsibility to coming generations. According to the dominating view held thus far, it is our generation's responsibility to find a solution to the problem of nuclear waste that allows it, once it is disposed of, to remain secure without surveillance.

The seminar examined this extremely important question in depth and agreed unanimously that we are, in any case, on the way toward a necessary shift in paradigms of our way of understanding. Basically two lines of reasoning were presented, both of which led, in principle, to the same conclusion.

According to the first and more detailed of the two, it is natural to demand two things from any technical product that is meant to be in use for a longer period: It must be safe in operation and, furthermore, reparable. The same qualities can be demanded of a nuclear waste repository. Safety in operation means, in this case, that the waste can be disposed of so that as far as we can predict, coming generations will not be obliged to take measures to protect themselves or their environment from it. Repairability means that coming generations can repair any mistakes we may have made in disposing of the waste.

Thus far safety in operation has been, almost without exception, the central theme of all discussion, research and political decisions regarding nuclear waste. This is the case, of course, because all debate on nuclear waste has arisen from the perspective of nuclear power. We have discussed the disposal of nuclear waste as a problem which can or cannot be solved as an argument for or against nuclear power. From that perspective, it makes sense to concentrate on the demand for safety in operation; thus, the repairability issue has remained in the background.

If, however, we proceed from the perspective of waste, i.e. putting emphasis on what we shall do with the considerable quantities of waste that must be dealt with regardless of how we proceed with nuclear power, the need for repairability becomes far more urgent. From this perspective we are forced to take into consideration factors like the difficulty of getting different experts to agree completely on whether or not various systems can be considered absolutely safe without the possibility of getting inside to repair them, not to speak of the human errors and incorrect calculations that can also occur in the construction of a final repository.

It was pointed out that from this aspect, it is difficult to see how we can decide on a method of final disposal which is "irreversible", irrevocable, in the sense that the need for repairability is not met to any reasonable extent. Then too, it also becomes clear that the demands for safety in operation and repairability are, in part, in conflict with each other. Safety in operation requires, at least in a certain sense, a sealed repository. Repairability requires, in a somewhat different sense, an accessible repository. The technical question of how both these requirements can be met simultaneously is still insufficiently explored.

In the second line of reasoning, predicted advances in knowledge played an important role. On the one hand, today we can hardly guarantee that knowledge of how to dispose of nuclear waste will exist for all time. From that perspective, repositories should be constructed so that they will need no surveillance once they are sealed. Thus, it is our responsibility to come up with a system that will not need active surveillance in order to ensure that safety can be maintained.

On the other hand it is also conceivable that advances in knowledge will be such that coming generations will have the capacity to deal with nuclear waste in a way that increases safety and/or allows the energy- resources latent in the waste to be put to use. The choice of what to do must devolve upon the generation in question and be based upon its own assessment of the advantages and disadvantages to be encountered. Furthermore, this implies that the repository be designed in such a way as to enable future generations to control it.

These lines of reasoning lead to a double conclusion: A repository should be constructed so that it makes controls and corrective measures unnecessary, while at the same time not making controls and corrective measures impossible. In other words, our generation should not put the entire responsibility for maintenance of repositories on coming generations; however, neither should we deny coming generations the possibility of taking control.

By means of different formulations and by proceeding from various starting-points, a two-edged objective was established vis-a-vis repository facilities: Safety in operation combined with repairability, with controls not necessary, but not impossible. Pre-requisites for the realization of this objective are the continued advancement of knowledge and refinement of the qualifications required to deal with nuclear waste.

REFERENCE

Swedish Consultative Committee for Nuclear Waste Management and National Swedish Board of Spent Fuel. Ethical Aspects on Nuclear Waste. SKN Report 29. Ethical Aspects on Nuclear Waste. Allmaenna Foerlaget, Stockholm, Sweden, 1988.