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An OECD Perspective of the role of Risk Assessment in Policy Development

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1. Introduction

OECD is an intergovernmental organisation bringing together 24 industrialised countries from North America, Western Europe, and the Pacific. Its basic aims include the following:

- to achieve high sustainable development, economic growth and employment;
- to achieve high economic and social welfare and a high standard of living throughout the OECD area and in non-Member countries:

The specialised Agencies and Directorates of OECD cover the full breadth of economic and social activities of concern to the Conference. Under their programmes, there are a variety of activities which involve various elements of qualitative and quantitative risk assessment. Risk assessment methodology, policies options regarding the use of risk assessment, the role of risk assessment in policy and decision-making are all routine in OECD work. This work ranges from, for example, work on the economics of investment policies, through work on food safety, to the analysis of nuclear safety technology.

2. The Role of Risk Assessment in Policy and Decision Making

The basic aims of the OECD, which I outlined above, reflect the fact that OECD and its Member countries are committed to strengthen current work, as well as undertake new initiatives, with the aim of enhancing economic development.

It has become clear, however, that global economic and development decisions should not, and can no longer be made in isolation from environmental, health and social welfare considerations. This fact is still fresh in our minds particularly after the recent United Nations Conference on Environment and Development.

Consequently, decision-makers in government, industry and public interest groups, must increasingly consider questions concerning sustainability and environment quality, including human welfare in their policy work. But without adequate information to assess the potential risks associated with alternative development possibilities, reliable policy and decision-making is not possible. In addition, without adequate information the degree to which various options might be sustainable into the future cannot be evaluated. In any case, we can no longer assume that we can always cure problems in either the world economy, or the environment, simply by reacting to them as they occur.

These decision-making trends have exacerbated a perennial problem, that is, scarce resources. The resources of international organisations such as OECD, as well as those of Member countries, are limited. We need, therefore, to be able to focus our attention on those issues

which are of highest priority. It is my belief that an increased knowledge of risk assessment, and its associated disciplines, have become increasingly important in the work of the OECD and its Member countries, partly because they enable us to set priorities in an increasingly meaningful manner.

Personally, I would like to see this process go further, and look forward to these disciplines playing an increasing role in the business of setting priorities. In fact, I expect that we each have a number of expectations from this Conference. Certainly, it should provide a "snap-shot" of risk assessment as it is currently practised in a variety of sectors. But beyond that, I hope, as I just implied, that we will see, the start of an analysis of the future needs with regard to the development of appropriate risk assessment methodologies, in relation to policy needs.

As an illustration, I would like to pose a number of questions and make some comments about each. These questions are not intended as a comprehensive "wish list" of future needs. On the other hand, if we had answers to some of these questions, I feel we would have come a long way. Certainly, these are the types of questions which must be addressed in the future:

(i) My first question is: how can we better cope with the situations we usually face, namely those in which we have limited information and much uncertainty? As I understand it, Dr. David Fisk, in particular, will be dealing with this question at the Conference.

In 1991, the Group of Economic Experts of the OECD's Environment Policy Committee began dealing with the role of uncertainty in decision-making in the area of development and implementation of policy for environmental protection; such work is attempting to mix objective scientific assessment and the need for subjective judgement.

(ii) My second question refers to a special case of uncertainty: how can risk assessments be linked to, and supportive of, the precautionary principle?

One of the implications of the precautionary principle is that one might wish to take action before one has exhausted the research effort; in fact, risk assessment can sometimes lead us intò a trap where its results will lead to a conflict of precautionary action versus further research; so one goal might be to **try to develop some guidance for** determining when prudent action should be taken immediately and when it should be deferred;

(iii) My third is, do we de-emphasize or delay action on low probability/high consequence events; and focus on the high probability/low consequence events?

(iv) If so, what do we do about high probability/low consequence events? Do we develop, for example, alternatives for only the most "dangerous" situations or do we attempt to promote a general shift to cleaner technologies to cover broad categories of events?

Following from these questions, I draw your attention to the Annex of this paper concerning the OECD's Nuclear Energy Agency and its programme on probabilistic safety assessment.

3. Participation in the Process

I would also like to say something about participation in the risk assessment process.

For risks to be effectively managed, I believe that it is a prerequisite that government, industry and the public are able to understand the sources of risk as well as the priorities in managing them. Many risk assessment methodologies are sophisticated and also generate large quantities of data which can be difficult to present and comprehend. New computerised systems which improve access to information offer only part of the solution.

But a key aspect is to increase participation in the risk assessment/risk management process. There are a number of key groups who must be involved, including those from government, academia, science, industry and the public.

Recent experience in the OECD Chemicals Programme on the co-operative investigation and risk reduction of existing chemicals has shown that the participation of industry is providing valuable input into the work. In the commercial and product life-cycle analysis being conducted as part of the development of risk reduction strategies on lead, cadmium, mercury, methylene chloride and brominated flame retardants, the knowledge of industry concerning the products and their end uses is essential. On the other hand, the initiation of these activities by the governments of OECD Member countries has increased the awareness of several industrial sectors of the need to improve their technologies and their products. Switching to cleaner technologies or developing new cleaner or more recyclable products, and switching to alternative materials are examples (based on relative risks).

Of course, the ultimate aim of risk assessment is the identification and reduction or elimination of those risks which are inconsistent with sustainable economic growth and development, and with environmental health and safety. There will be a high-payoff for work that improves, streamlines, and increases the transparency of approaches to risk assessment and links their results to innovative, priority-based and effective methods for risk reduction and management. Following some of the dialogues opened by this and other international conferences and the many new initiatives of government, industry and international organisations, a new era in risk assessment and management will encourage increased participation in the risk assessment process.

4. Concluding Remarks

It is my impression that there has been in recent years, a renaissance in the field of environmental risk assessment. Of course, we are all keenly aware of the many analytical shortcomings, as well as a lack of information which has often given ambiguous even contradictory results. On the other hand, we know that many new concepts, methods and approaches are emerging. I hope that this conference will help us in the continuing evolution of the approach, so that ultimately, risk assessment practices will lead to a more rigorous policy development and decision-making.

ANNEX

Risk Assessment Programmes at the OECD's Nuclear Energy Agency

For the Safety of Nuclear Power Plants

PSA techniques were originally developed in order to assess the risks to the health of populations from the operation of power plants. They are now becoming more important in supplementing the traditional deterministic approach to determine potential weaknesses and to assess the safety level of the plants. Presently, about two hundred probabilistic studies have either been completed or are in progress. PSA experts of the Principal Working Group No. 5 of the NEA's Committee on the Safety of Nuclear Installations are deeply involved in the process of reviewing the methodology, application and maturity of this emerging safety tool.

Methodology

This is the main direction of the group's activities. Most recently, a workshop was held to provide a forum for exchanging information on the experience, development and needs in the most problematic areas which include analysis of dependencies, time-dependent phenomena, human errors, uncertainties and external events. Some conclusions from this workshop are given below:

In the area of analysis of dependencies, Common Cause Failures (CCF) are still a concern due to scarce data in this field and a procedure of framework for acquiring common cause data as well as allowing to exercise engineering judgement more consistently should be achieved. For time-dependent phenomena, components may be noticeably affected by "ageing" or "learning". This effect varies with the type of component, its function at the plant as well as the maintenance programme, therefore plant specific evaluations are required. In the field of human errors there is a need of reliability data to analyse knowledged-based actions especially those related to non-full power and shut-down situations and accident management. A very important aspect is the evaluation of operating experience and simulator experiments for obtaining human error probabilities. The problem of transferring simulator experience to real situations was believed to be solved to a large extent by using experience gathered in experiment situations. Expert judgement is also believed to give good results in this context. For those reasons, human error is still considered as an area which requires research in order to arrive at more reliable PSA results. Concerning the task of quantifying uncertainties, there is a general agreement that the uncertainties affecting reliability data could be treated satisfactorily. However, some weaknesses in the handling of modelling uncertainties have been recognised and an exploration of a possible theory for treating uncertainties is deemed desirable. For external events, it also appeared that uncertainties of results are still substantial and that for analysing plant responses to seismic loads considerable expert judgement is still needed.

Application

The development of PSAs has resulted not only in an increase in the number of analyses performed but also and more importantly, in expansion of their scope of application. A study, published by the OECD Nuclear Energy Agency in 1989, entitled **Probabilistic Safety Assessment in Nuclear Power Plant Management** demonstrated the benefits afforded by PSA in the management of safety in NPPs. According to the authors, the implementation of PSA will reduce the frequency of significant incidents and accidents. A wider use of PSA in the

process of accident management for the prevention of severe accidents as well as the mitigation of their consequences can be expected in the near future.

A new report published by the NEA entitled **Living Probabilistic Safety Assessment for NPP Management** describes recent international development in the use of PSA. Recent applications of PSA techniques have demonstrated their unique ability to assess proposed modifications and engineering configurations to operating plants. This ability to monitor the impact of design and procedural changes that improve the overall safety makes a "living" PSA programme a powerful tool for supporting decisions that affect plant safety and foster understanding between the utility and the safety authorities. A workshop was held in May 1992 where it was possible to observe the progress in the development of living PSA programmes in most of the OECD countries which should fairly soon lead to many applications.

The Future

Experts agree that establishment of generalised criteria for the acquisition of reliability data is needed. Supposing those criteria would be adopted internationally, an intercomparison of data would then become possible that would give a better guarantee that generic data would really apply to components under consideration. This approach is needed not only for active mechanical and electrical components, but also for passive components and human actions.

Despite the current limitations, the practical experience gained from the application of PSA methods and the confirmation of PSA results by comparison with operating experience data, has led to the emergence of PSA as an essential role in the field of nuclear safety, in combination with the deterministic methods and defence in depth. Some countries are already using PSAs in the licensing process for their latest plants and several others are planning to use them for future plants. It is only a matter of time before PSA becomes a universal fixture in the licensing and regulatory process.

For Environmental Protection and Radioactive Waste Management

Risk assessment is also an essential element in other areas of nuclear activities, such as the evaluation of the potential impact of nuclear accidents and the evaluation of their consequences and the safe disposal of radioactive waste.

Radiological Risk

With regard to the evaluation of the radiological consequences of nuclear accidents, NEA has prompted an intercomparison exercise on probabilistic consequence assessment codes (PCA) with the objective to:

- contribute to PCA code quality programmes;
- guide future developments in the PCA field by identifying the merits and appropriate use of different methods;
- enhance the general appreciation of the applicability of PCA codes by those who develop and use them, particularly in decision-making and regulatory contexts;

- provide a forum for discussion on various international approaches to PCA model and code development, and to encourage harmonization of codes;

- produce a report on the exercise which will act as a basic PCA code comparison reference.

Another area where the activities are rapidly developing in the field of radiation protection is the application of the new ICRP recommendations to the control of the so-called potential or probabilistic exposures, namely those exposures to radiation that can result from accidental events. In this field, the NEA is beginning to study the possible approaches and criteria for the management of potential exposures in the operation and the regulation of nuclear facilities.

In addition to the above, it is also expected that the exercise will generally increase the understanding of uncertainties in PCA codes and thereby assist in the identification of priorities for future research.

Risk Due to Radioactive Waste

In the field of radioactive waste management, the safety of any proposed disposal system must be convincingly shown prior to its implementation and risk assessment studies are therefore the most important part of licence applications. In particular, safety assessments provide the principal means to investigate, quantify and explain the long-term safety of a selected disposal concept and site. Safety assessments consist usually of the following interrelated elements:

- identification of the possible future evolution of the system or scenario development;

- development and application of appropriate models;

- evaluation of potential radiological consequences in an integrated assessment;

- uncertainty and assessment analysis;

- validation and review of all components of the assessment; and

- comparison of the results with safety criteria.

Over the last decade, many safety assessments have been conducted for various purposes, such as assisting in the understanding of the long-term behaviour of a disposal system, quantifying this understanding and making predictions about the future, preparing licence applications or orienting research activities in the areas of significance. Risk assessment methodologies in the nuclear waste disposal field have now reached a certain degree of maturity and sophistication. There is a consensus at international level that reliable safety assessment methods are available today to evaluate the potential long-term radiological impact of nuclear waste repositories (Ref. 1, 2, 3 and 4). The improvement of these methodologies is still one of the main priorities of the programme of NEA, notably the modelling of the transport of radioactive substances through the geosphere and the biosphere, the use of probabilistic techniques, the quantification of uncertainties in risk assessment and the identification of potentially disruptive scenarios, including human intrusion at disposal sites.

References

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