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Managing risk and managing the risk discussion: lessons to be learned from the nuclear waste discussion

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MANAGING RISK AND MANAGING THE RISK DISCUSSION:
LESSONS TO BE LEARNT FROM THE NUCLEAR WASTE DISCUSSION

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INTRODUCTION

In the context of European regulation for handling radiological waste from non-nuclear sources[2], relatively large quantities of substances with a relatively low radioactive will require special treatment and even safe storage for relatively long periods of time. As a consequence, the economic viability of commercially important products and production processes might even be in danger, see Scholten et al., 1993; Scholten, 1996.

Disposal and (underground) storage of nuclear industry's radioactive waste has been and still is a hot political issue in many countries. At the centre of these discussions are controversies over both the definition of acceptable risk and the factual risks attached to the different waste disposal scenarios. As a result of these controversies, no broad social and political acceptance has been realized for underground waste disposal facilities (in salt, rock), which seem to be the best alternatives from an engineering poin of view. Planning such facilities is stagnating and the political compromise, also in the Netherlands, is to design future facilities in a way that the waste stored can, in principle, be taken back if there is a reason to do so in the future. The lack of a politically acceptable nuclear waste disposal scenario is one of the major reasons for the current stagnation in the development of nuclear power. The strategic position of the radioactive waste disposal issue in the overall nuclear energy debate has resulted in inflexible positions on both sides of the debate and has not laid a basis for rational discussion on the assumptions, the methods and the outcomes of risk calculations.

The nuclear waste disposal discussion is the context in which other discussions on radiological risks will take place. In order to manage the risk of non nuclear industry radiological waste, it will be necessary to manage the risk discussion as well. Many lessons can be learnt from the nuclear waste disposal discussions[3]. In order to avoid mistakes, it is necessary to understand why many if not most strategies that tried to deal with the discussion on risks from nuclear waste did not lead to success. On the contrary, many of them merely increased the conflicts they tried to solve.

This paper analyses the nature of the risk discussion on nuclear waste disposal on the basis of a case-study of Dutch developments. It then addresses the development of the chaning risk concept itself and

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[2] Especially Council Directive 96/29/Euratom of 13 May 1996, in: *Official Journal of the European Communities*, L159, Volume 39, 29 June 1996.

[3] This article is primarily based on a project carried out by the author which aimed at improving the discussion on underground disposal of nuclear and non-nuclear waste in the Netherlands. See De Man, 1991.

the changing ways of dealing with conflicts over (nuclear) risks in public decision making. Finally, some suggestions for dealing with discussions and conflicts related to radiological risks from non-nuclear industry sources will be formulated.

THE DUTCH DISCUSSION AND NON-DECISION MAKING ON RADIOACTIVE WASTE DISPOSAL

In the fifties and the sixties, nuclear energy was still thought to deliver a considerable part of safe and cheap energy to the Netherlands. By the year 2000, 35000 Mwe nuclear power would have been installed, according to official planning of the late sixties. Reality was very different, not only because of the availability of large quantities of cheap and clean natural gas but also because of technical and political problems in the development of the nuclear energy system in Europe and worldwide[4]. One problem has never been solved: the disposal of radioactive waste. We give a short overview of the political development that systematically resulted in non-decision[5].

1969 the construction of the first (and last) large nuclear reactor in the Netherlands (Borssele) was decided and not long after that a working group of the Dutch nuclear research and development institute RCN started studies on possibilities to store radioactive waste in salt formations. After 1969 the perspective on nuclear energy was rapidly and dramatically changing. In the 1974 white paper on energy (Energienota) not much was left of the hithero existing nuclear optimism. Instead of 35000 MWe the paper proposed a moderate growth by 3 additional plants of 1000 MWe each. Public opposition against nuclear energy was growing and because of the ample natural gas availability there was no justification for dramatic nuclear energy programmes. But even this moderate 3000 MWe plan proved to be a technocratic illusion: after Borssele no nuclear plant has been built in the Netherlands and no one will be built in the foreseeable future.

Between the early seventies and today, many studies to assess different technical scenarios for nuclear waste disposal in salt mines have been performed. As early as 1975 an interdepartmental Committee (ICK) concluded that salt mines would provide good solutions to the waste disposal problem[6]. This committee's conclusions were supported by other committees and institutes and it was stressed that underground disposal would lead to far less risks than disposal on the earth's surface. ICK repeated its conclusions in 1979 and published a list of criteria to which to salt dome should conform. At the time, the anti-nuclear movement had gained increasing momentum and it opposed fiercely against the conclusions of ICK's studies and the government's proposals for planning underground disposal facilities. When in 1979, the second white paper on energy was published by the Dutch government, public opposition against nuclear energy had increased to an extent that the government decided to have a National Public Discussion. Therefore it postponed all decisions that were meant to select concrete salt mine locations but decided to continue technical research on the issue. The main research programme on storage in salt mines was done by the OPLA research committee from 1981 onwards. During the Public Energy Discussion[7], the nuclear waste disposal theme proved to be a very controversial theme. In 1982 a so-called "controversy session"[8] was organized in Groningen, the region in which most potential disposal

[4] This development has been analyzed in some detail in my dissertation, see De Man 1987.

[5] A highly detailed account can be found in De Man 1991.

[6] Precise literature references can be found in De Man, 1991.

[7] Brede Maatschappelijke Discussie (BMD) or Maatschappelijke Discussie Energiebeleid (MDE).

[8] controversezitting

locations had been identified. The conflict over nuclear waste disposal thus added a regional aspect to the nuclear energy conflict: the political centre of power ("The Hague") against regional interests in the North of the Netherlands. Evidently, this session has not been able to resolve the conflict or even to produce a common problem definition between the "atoomlobby" and its critics. Mutual distrust had grown very deep and each side questioned the other side's technical and scientific competence. The real issue, however, was deeply political.

The Public Energy Discussion had not solved any of the basic conflicts underlying the controversies over desirable energy paths. *De facto* it had postponed almost all strategic decision issues, and as natural gas had converted the Netherlands into a net energy exporter, pressure on developing nuclear energy gradually faded away, whereas the anti-nuclear front remained powerful. After the Public Energy Discussion, the government published a white paper on radioactive waste. It was decided to store radioactive waste on the surface for some time (the organization COVRA would be responsible) but is was optimistic that a solution for final disposal could be found in salt formations.

The OPLA Research Committee would carry out a technical research programme. As this committee started working on the issue, it made clear that a criterium was needed in order to assess the acceptability of the different technical scenarios. The criteria developed in the sixties and early seventies by ICK were generally found inadequate and therefore the Dutch Environmental Ministry (VROM) announced in 1984 to develop a radiological criterium to assess radioactive waste disposal alternatives. Whereas Energy Policy, including all technical research on disposal facilities, remained firmly in the hands of the Economic Affairs Ministry, the Environmental Ministry was stuck with the problem of defining acceptabilty criteria. This division of labour did not prove very productive. Three years later, no ~~criterium had been developed yet. Instead the Ministry developed an open ended procedure on the basis of a discussion paper. It contained many more questions than answer and that was so badly written that many did not understand the questions at all and provoked such a confusion that the discussion process~~ was stopped before any conclusion had been reached.

In the meantime OPLA performed Phase I of its model studies on a number of nuclear waste disposal scenarios, including three salt types, two disposal techniques and three different waste scenarios. Mainly for political reasons, it did not refer to any concrete location yet. In 1989, it concluded that an acceptable solution would be feasible in principle and that more concrete, location-specific research was needed. Again the results of the OPLA research was very much criticized by anti-nuclear critics. Apart from criticism on the assumptions and calculation methods used, it was felt that the acceptability of the different scenarios should be based on a clear radiological criterium, which was still failing.

In 1989, the first National Environmental Policy Plan (NEPP) was published, which contained a number of strategies and concrete actions. One action (A64) referred to finding acceptability criteria for underground (nuclear and chemical) waste disposal. A public discussion procedure was used as an input to governmental decision making. As a result of public and politcal debate, it was decided that salt mines should be designed that take-back of the waste should be possible during the operational phase of the mine. Technical research that is being carried out by CORA, that followed up OPLA, is focusing on waste disposal with such a take-back option[9]. At present, 1997, research is being carried out, but there is no concrete planning for construction of disposal facilities underway. Nuclear energy is not a big issue anymore. The only headlines in the newspapers refer to decommisioning the two Dutch nuclear plants.

[9] A design has been made with the name "METRO", see Heijdra & Prij 1997.

CHANGING RISK AND SAFETY CONCEPTS AND CHANGING MODELS FOR RISK DECISION MAKING

Four Phases in Thinking about Acceptable Risk

The history of nuclear power and the accompanying political conflicts is also a history of risk, risk philosophies and risk policies. Throughout the entire period described above (from the early sixties up to present) we see that technical safety studies performed for nuclear industry and government came to the conclusion that in principle underground nuclear waste facilities would be feasible that would not contribute to radiological risk above natural background radiation. Systematically, these studies did not convince anti-nuclear groups and politicians. On the contrary, they were and are still being viewed as partisan analyses serving the interests of nuclear industry. Only options with take-back possibilities appear to be politically acceptable, although these options may not be the optimum from a technical risk analysis point of view. The relationship between political decision making and risk analysis has been a difficult one and although risk and safety concepts have become more sophisticated, they have not been able to bridge the gap between technical analysis and political conflict. We give a short overview of this development.

The development of risk and safety concepts can be divided into four phases, going from an engineering approach in the direction of including social and political aspects more explicitly[10].

- Phase I (the sixties) concentrated on engineering concepts of risks;
- In Phase II (the seventies and early eighties), the problem of risk perception and 'subjective risk' became at the centre of policy making and research;
- Phase III (from the late eighties onward) focused more on the active communication of information about risks to the public ('risk communication'),
- In Phase IV (present) the political, institutional and ethical aspects of risk & safety become more central to the debate.

Phase I started in the late sixties with the well-known article of Starr (1969): "How safe is safe enough?". Risk was defined as a simple product of probability of the event and the negative impact of the event. On the basis of empirical research on the risks people take for granted in daily life, normative assumptions were derived for levels of acceptable risk. Often it was assumed that death risks of 10^{-6} are acceptable to average people. Starr's approach combined the engineering perpective on risks and the insurance approach to dealing with risks. From empirical research it became more and more clear that people appear not to be very consistent in dealing with risks. In Phase II, social scientists asked themselves, why certain risks are accepted by people and other (same of lower) risks are rejected. This was prominent in the nuclear energy debate. The issue became "risk acceptance" rather than "acceptable risk" and the social and psychological factors that explain the (non-)acceptance. Public policy tried to take such factors into account on the basis of research that distinguished between many 'subjective' factors that explained the acceptance of certain risks rather than only one measure of 'objective' risk[11]. But even this public policy did not prove very effective when it came to design public policies that would be acceptable to the broader public. What was apparently missing from these publicies was the communication to the people by which the policies had to be accepted.In Phase III, the "risk

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10 Here I summarize the main argumentation of studies that I performed in Germany: see Ueberhorst & De Man, 1990.

11 See for example Vlek 1997.

communication" phase[12], policy makers tried to communicate risks to target groups, in order to influence risk perceptions and reducing public resistance. Even this more communicative policy did not remove any barriers against the acceptance of supposedly risky technologies such as nuclear power.

In fact, policies that tried to remove resistance to nuclear energy made two fundamental mistakes. First, they were still very much focused on convincing the public of the technology's safe character instead of listening carefully to the arguments of the critics and to engange in a serious debate on those arguments. Second, they were more than often based on the false perception that general public's beliefs were the barrier against acceptance of nuclear energy. The problem was therefore defined as bridging the gap between the well-informed expert and the poorly informed citizen. Reality was different. Those who managed to block nuclear energy development were by no means average citizens from the street but highly specialized experts who were well educated and well informed about the latest technical and political facts. The fact that policy-makers tried to treat these contra-experts as ignorant lay-people only contributed to the nuclear energy conflict.

There are signs that policy makers and experts are recognizing that their job is not to convince uninformed people but rather to engage in serious discussion with them. The topics in this latest phase (Phase IV) have changed from the communication issue to decision making structures and the ethical foundations of risk and safety judgments. The question is no longer why the critics have 'false' risk beliefs but (a) what are the conflicting safety philosophies by which different parties come to different risk and safety judgments and (b) what political procedures and institutional structures are legitimate to deal with these conflicts and to justify risk-related political decisions.[13]

Implications for the Radioactive Waste Disposal Debate

The radioactive waste discussion in the Netherlands and in other parts of the world has been (and still is) dominated by deep mistrust between the parties involved. Strategies that were based on the assumptions of the phases I, II and III could not resolve the conflict. On the contrary, as they did not take the criticisms and the critics seriously, they only enhanced mistrust. They also neglected the strategic position of the nuclear waste discussion in the overall nuclear energy discussion. Attempts at discussing nuclear waste disposal safety issues in isolation necessarily failed. The attempt in the framework of the Dutch environmental policy plan's "Actie 62" at discussing both chemical waste and nuclear waste at the same time without considering the nuclear issue as a whole could only fail since it did not relate to the structure of the political problems at stake.

For the future debate on risks related to nuclear waste disposal, the following should be kept in mind:

- Technical discussions should not be held in isolation from the discussion on criteria for assessing radiological risks;
- Discussions on criteria for assessing radiological risks should not be held exclusively within technical communities but should involve social and political actors representing different streams of thought;
- Great care is needed in the design of the institutional framework in which such discussions will take place.
- Discussions on risks of nuclear waste should be embedded in discussions on energy strategies and cannot be restricted to the waste disposal problem.

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[12] See National Research Council 1989.

[13] See also Stern 1991.

MANAGING THE DISCUSSION ON RISKS FROM NATURAL RADIOACTIVITY IN THE NON-NUCLEAR INDUSTRY

Large amounts of waste containing natural radionuclides will be in need of treatment, storage and disposal because of the dose limitations in the EC directive 96/29/Euratom. In the area of high level radioactive waste (nuclear waste), we have seen little progress in planning final storage facilities. Although we are talking here about a quite different category of waste, the nuclear waste heritage will play an important role in the coming public discussion and the coming development of policies that deal with this type of waste:

- not all public actors will be able or will want to make a proper distinction between the two categories. The emphasis will potentially be on 'radioactive', not on the amount of radioactivity;
- although the issue has no links to the nuclear energy debate, it may well be used by anti-nuclear critics in their campaigns against nuclear energy in particular and radioactive pollution in general;
- there is a possibility that strategies to deal with resistance against storage and disposal facilities will actually enhance the conflicts, as they did in the nuclear waste disposal debate.

Managing the risk discussion will be a central issue in the period to come. Although the precise nature of the coming discussion and the coming conflicts cannot yet be foreseen, the following guidelines could be useful:

- separate the discussion on natural radionuclides as much as possible from the nuclear energy discussion. In practice that may mean: do not involve the same institutions, people and routines;
- do not make the same mistakes as have been made in the nuclear energy discussion, see also the points below;
- do not restrict the discussions on technical risk analyses but allow for discussions about risk philosophies and radiological criteria;
- focus the discussions on concrete substance chains[14] and strategic issues (alternative scenarios) related to them: for example, the risks of radioactive waste arising from the production of metals from ores should be discussed within the context of the substance chain management for the particular metal.

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[14] See De Man, 1993, De Man, 1994, De Man et al. 1995, De Man et al. 1997.

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