



POLICY ISSUE

(NEGATIVE CONSENT)

June 27, 1990

SECY-90-229

For: The Commissioners

From: Harold R. Denton, Director
Office of Governmental and Public Affairs

Subject: NRC REVIEW OF "NORDIC" CONSULTATIVE REPORT ON
HIGH LEVEL WASTE DISPOSAL

Purpose: To inform the Commission about the effort by several
"Nordic" countries to develop a comprehensive set of
criteria for HLW disposal in the Nordic countries, the
staff's comments on those criteria, and the proposed
scheduling of an NEA-sponsored workshop during November
1990 in Paris to discuss the proposed criteria and related
repository licensing considerations.

Background: The Radiation Protection and Nuclear Safety Authorities in
Denmark, Finland, Iceland, Norway and Sweden (collectively
referred to as the Nordic Authorities -- NA) have prepared a
"Nordic" report entitled, "Disposal of High Level
Radioactive Waste - Consideration of Some Basic Criteria -
A Consultative Document." This report has been sent out for
review and comment to nuclear regulatory authorities in many
countries, including the NRC, with a request for comments,
(Attachments 1, 2, and 3 provide the correspondence related
to this Nordic initiative). The Office of Nuclear Material
Safety and Safeguards (Daniel Fehringer) and the Office of
Nuclear Regulatory Research staff have reviewed this
document with the view to determine similarities/
dissimilarities with the regulatory approach taken in the
U.S., and have provided their comments in Attachment 4.
These comments will be transmitted to the requestor,
Dr. Snihs. (The U.S. Environmental Protection Agency (EPA)
was also asked to review the proposed criteria and will
provide comments to the Nordic Authorities separately.) The

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NOTE: TO BE MADE PUBLICLY AVAILABLE
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Nuclear Energy Agency (NEA) has scheduled a workshop for November 5-7, 1990 (in Paris) when the various national and international HLW disposal criteria, including those proposed by the Nordic Authorities, will be reviewed and discussed with emphasis on regulatory and licensing implications related to the selected criteria.

Discussion:

The Nordic report is the latest of a series of working drafts which compiled the joint views of the Nordic authorities on radiation protection issues. These views will be taken into account in their later work when they start developing national regulations. The report presents a set of radiation protection criteria. The respective regulatory authorities are expected to apply these criteria when developing more specific guidelines aimed at demonstrating that a particular site and technical design of a deep geological repository meet all the postulated safety criteria. In developing these criteria, the writers took into account recommendations of the International Commission on Radiological Protection (ICRP), and ideas presented by the NEA and IAEA (including IAEA's recently adopted Reference Series 99 report, "Safety Principles and Technical Criteria for Underground Disposal of High Level Wastes," about which the Commission was informed last September when NMSS performed a review of a draft version of this report).

Radiation Protection Criteria

The overall scope of the radiation protection criteria presented in this document is quite similar to that of the U.S. regulatory criteria for HLW disposal, although there are significant differences in the details of the criteria. The Nordic document begins by stating the following general objective:

The disposal of high-level waste shall aim at protecting human health and the environment and limiting any burden placed on future generations.

This objective is then followed by twelve criteria of increasing levels specificity, as summarized below.

Criterion 1

Future risks shall not be greater than would be currently acceptable.

Criterion 2

Disposal safety shall not rely on long-term institutional controls or remedial actions.

Criterion 3

Individual doses, excluding unlikely events, shall be less than 0.1 mSv (10 mrem) per year. The probabilities and consequences of unlikely events shall be assessed qualitatively and, when practical, numerically for comparison with the risk corresponding to 0.1 mSv per year.

Criterion 4

The total rate of radioactive release to the biosphere shall be less than 0.1% of the rate of release of natural long-lived alpha emitters. Each Nordic nation's release rate would be equal to its pro rata share of world-wide HLW generation.

Criterion 5

Radiological impacts shall be "as low as reasonably achievable."

Criterion 6

Safety assessments shall be based on qualitative judgment and on quantitative results from models that are validated to the extent practicable.

Criterion 7

A quality assurance program shall be established.

Criterion 8

A passive multiple barrier design shall be used so that deficiencies in any barrier, or changes in repository conditions, will not substantially impair overall performance.

Criterion 9

The repository site should have good hydrologic, geochemical and tectonic characteristics, and should not be located near natural resources.

Criterion 10

The repository depth and configuration should protect waste from external processes and events, and should accommodate construction disturbances and geochemical and thermal changes resulting from the HLW itself. Nuclear criticality should be avoided.

Criterion 11

Backfilling and closure of the repository should contribute favorably to containment and isolation of the waste.

Criterion 12

Waste packages should provide substantially complete isolation of waste for "an adequately long period," and should limit the average rate of release from the repository "to a sufficiently low level."

Comparison with the U.S. Approach

These criteria differ from the U.S. regulatory structure primarily because the Nordic document places significant emphasis on individual doses and risks far into the future, following the recommendations of the International Commission on Radiological Protection. In contrast, the U.S. Environmental Protection Agency (EPA) standards restrict individual doses for only a limited time (1,000 years) after repository closure.

The Nordic document is similar to the U.S. EPA standards in that it contains both a restriction on total release from a repository and limits on individual doses. The purpose of the total release limit is to preclude a "dilute and disperse" approach to HLW disposal. The basis for the Nordic release limit (comparison with releases of natural radioactive materials into the environment) is analogous to EPA's examination of the impacts of unmined uranium ore bodies in the derivation of its release limits, and the allowable levels of release are roughly the same in both criteria. However, EPA's derivation of its standards was based on an additional factor not considered in the Nordic criteria -- an analysis of the waste isolation capabilities of hypothetical geologic repositories.

The Nordic criteria and EPA's HLW standards both contain probabilistic features. The EPA standards place limits on the probabilities that releases will exceed specified values, while the Nordic criteria refer to the "risk" to an

individual. In this context, "risk" is understood to mean the product of the probability that a release will occur and the resulting likelihood of fatality caused by the release. In the Nordic proposal, numerical calculations of individual risk are to be presented, but only "whenever practicable." Similarly, the EPA standards require numerical evaluations of performance only "to the extent practicable." However, the wording of the EPA standards seems to place more emphasis on numerical evaluations of compliance than does the Nordic criterion.

Finally, the Nordic proposal requires "optimization" of radiation protection (i.e., that radiological impacts be as low as reasonably achievable). U.S. criteria (10 CFR Part 60 and the EPA standards) do not contain such a criterion because the already stringent release limits of the standards, when combined with the subsystem criteria of 10 CFR Part 60, are expected to ensure that releases will be as low as reasonably achievable (see 48 FR 28198, June 21, 1983).

The Nordic proposal and its differences from other international waste disposal criteria will be discussed at length at the November 5-7, 1990 workshop mentioned above, with emphasis on regulatory/licensing aspects associated with the above criteria. The U.S. role at this meeting will be confined to commenting on the regulatory implementation of disposal criteria and to offer other constructive comments, as appropriate, without offering to support an international consensus on them. NEA staff has also confirmed that the agency is not looking to obtain a consensus on this matter.

NRC Action

The Office of Governmental and Public Affairs, International Programs, will transmit the staff's comments to Mr. Jan Olof Snihs, Chairman of the Nordic Working Group at the National Institute of Radiation Protection in Stockholm, Sweden, ten working days after the date of this paper, unless directed otherwise by the Commission.

An NMSS staff specialist plans to participate in the Paris workshop, and will report on its outcome. International Programs will coordinate with the other U.S. agencies likely to participate in the workshop (EPA and DOE) to help develop a unified U.S. Government view on this subject.



Harold R. Denton, Director
Office of Governmental and Public Affairs

Attachments:

1. Ltr frm Jan Olof Snihs dtd 1/26/90
2. Ltr frm O. Ilari dtd 12/20/89
3. Ltr frm Jan Olof Snihs dtd 11/24/89
4. Staff comments

SECY NOTE: In the absence of instructions to the contrary, SECY will notify the staff on Wednesday, July 11, 1990, that the Commission, by negative consent, assents to the action proposed in this paper.

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High level radioactive waste including spent fuel will be finally disposed of during the 21st century in Finland and Sweden. The nuclear power industry has since some years already started extensive research and a number of investigations in order to clarify and solve remaining problems within the given time schedule. Meanwhile there have been discussions by the national authorities responsible for radiation protection and nuclear safety in the Nordic countries on the principles for and requirements on a repository for final disposal.

During early 1987 a working group was convened with members from the Finnish and Swedish radiation protection and nuclear safety authorities with the aim to produce a draft proposal concerning basic criteria for the disposal of high level radioactive waste.

This work is now finished and there is a Nordic report with the title "Disposal of High Level Radioactive Waste. Consideration of Some Basic Criteria. A Consultative Document".

The report is the first step in a two-step procedure to achieve formally accepted criteria during 1991 for disposal of high level waste in the Nordic countries. This report is now sent out for comments which will be taken into account in the preparation of the final version. Because the possible long term consequences of disposal of high level waste are not only a national problem but even more of international concern, [REDACTED]
[REDACTED]
[REDACTED]

Therefore, on behalf of the authorities for radiation protection and nuclear safety in the Nordic countries we formally make an urgent and serious request that you and your organisation will study the report and give your written comments to us before the 1 June 1990. We are convinced that this procedure will also contribute to get the various national ideas to converge eventually towards an international consensus.

Yours sincerely

Gunnar Bengtsson
Director General

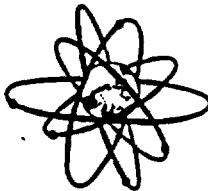
Jan Olof Snihs
Deputy Director General
Chairman of the Nordic Working Group

Attachment 1

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Paris, 20th December 1989

Dear Dick,

Swedish Proposal for the Organisation of a Workshop on Radiation Protection and Other Criteria for the Disposal of High Level Radioactive Waste

You should have received in the last few days document RWM/DOC(89)6 which was sent to you by the RWMC Secretariat. As you can see in that document (another copy of which is attached), the proposal formulated by Dr. Snihs concerns a subject which is certainly of interest to the CRPPH as it is to the RWMC.

A possible initiative along the lines suggested by Dr. Snihs should thus be undertaken jointly by the RWMC and CRPPH. It is, therefore, appropriate that the RWMC examine this proposal, at their next meeting of 23rd and 24th January 1990, having already the benefit of a point of view from the CRPPH side.

For this purpose, I should like you to let me know, before 17th January 1990, your opinion on the proposed Workshop and any possible suggestions concerning its scope and programme.

I look forward to hearing from you.

Yours sincerely,


O. Ilari

Mr. R.E. Cunningham
Director, Division of Industrial and Medical
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c.c. United States Delegation to the OECD
Encl.: RWM/DOC(89)6

ORGANISATION FOR ECONOMIC
CO-OPERATION AND DEVELOPMENT

RESTRICTED

Paris, drafted: 5th Dec. 1989

NUCLEAR ENERGY AGENCY

distr.: 14th Dec. 1989

RWM/DOC(89)6

Engl. Text Only

COMMITTEE ON RADIOACTIVE WASTE MANAGEMENT

Swedish Proposal for the Organisation of a Workshop on Radiation Protection
and Other Criteria for the Disposal of High-Level Radioactive Waste

1. As mentioned in the summary record of the Performance Assessment Advisory Group (PAAG) meeting, held in Paris last October [see document SEN/RWM(89)7, paragraph 33], a suggestion was made by Dr. Boge from Sweden to organise a workshop on approaches for developing long-term radiation protection and other criteria for waste disposal. After discussion, PAAG noted that the suggestion was of significant interest and decided that it would be appropriate to consider it further at the forthcoming meeting of the RWMC. Following this preliminary discussion within PAAG, Dr. J.O. Snihs, in his capacity of RWMC member from Sweden, sent the attached letter to the Secretariat in order to confirm the initial suggestion and to clarify the reasons behind the proposal as well as the possible scope of the suggested workshop.

2. From the point of view of the Secretariat and provided there is support for such a workshop from a sufficient number of countries, it would appear desirable to consider favourably the Swedish proposal. In addition to a presentation and discussion of the proposed Nordic documents, other national approaches and criteria should be presented and discussed at such a meeting. Furthermore, given the importance of radiation protection criteria for waste disposal, it would be desirable to associate the Committee on Radiation Protection and Public Health (CRPPH) with the organisation of the workshop.

3. On the basis of the above considerations, it is proposed that the RWMC consider the Swedish proposal for a Workshop on Radiation Protection and Other Criteria for High-Level Waste Disposal at its next meeting in January 1990 under Item 5.b of its agenda. The RWMC will be invited in particular to:

- comment upon the purpose and scope of such a workshop;
- take into account the preliminary views of the Bureau of the CRPPH which the Secretariat will consult on this proposal in the meantime, and
- possibly, decide on the organisation of an NEA workshop in this field in cooperation with the CRPPH.

1989-11-24

Dr J.P. Olivier
Division of Radiation Protection
and Waste Management
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FRANCE

Dear Dr Olivier,

On behalf of the Nordic authorities on radiation protection and nuclear safety and the Nordic working group on criteria for disposal of HLW I propose that NEA by its committees RWMC and CRPPH will organize a workshop on the [REDACTED] on disposal of HLW. A few specific topics in this area should be particularly elaborated e.g. various basis for judgement of acceptability (individual doses, risks, collective doses, comparison with natural activity flows and others), the handling of uncertainties in the long time perspectives and other conceptual and practical problems in the application of the criteria etc. The workshop should be for 2 days in Paris and an appropriate date would be sometime in the weeks 47 or 48 in 1990 e.g. around 20 November 1990.

There are several reasons for this proposal:

1) Since two years there is a Nordic working group developing criteria for the disposal of HLW. It has now finished the first phase of its work and will in about a month publish a consultative document on the subject. It will be a document from the Nordic authorities in radiation protection and nuclear safety and it will be sent out to many international organisations and national authorities for comments before 1st June 1990. The redrafting

Attachment 3

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of the document will start in the second half of 1990 and a final document will be published in 1991. From that point of view a workshop in November 1990 would be most appropriate.

2) There are discussions in many countries on criteria for disposal of HLW and therefore it is probably a broad interest to get an opportunity to discuss the issues in an international forum.

3) IAEA has recently adopted safety principles and technical criteria and these should be interesting background material in comparison with national proposals like the Nordic and others for the discussions in a workshop.

4) The nuclear industry is going on very fast with its planning work and research in the area of disposal of HLW, sites are being investigated etc. and there is an increasing need to have criteria and guidance from national authorities within 2-3 years at the latest. Because many of the problems with the disposal of HLW are global and of long time character it is urgent to reach international consensus as much as possible.

5) NEA has of course a potential interest in the subject through its committees RWMC and CRPPH and there are now some years since its last direct involvement in the problems of basic criteria for disposal of HLW (1984's publication on the long term radiation protection objectives for radioactive waste disposal). Therefore considering the current work going on in many countries on these problems it is quite appropriate and in line with the objective to serve member countries' interest that NEA will organize such a workshop.

If accepted by the Secretariat this proposal could be sent out and discussed in the next meeting of the RWMC in January 1990. The Secretariat is of course free to transform this proposal to a NEA format appropriate for the RWMC meeting.

Best regards
Yours sincerely



Jan Olof Snihs

USNRC STAFF COMMENTS ON NORDIC CONSULTATIVE DOCUMENT
"DISPOSAL OF HIGH LEVEL RADIOACTIVE WASTE
CONSIDERATION OF SOME BASIC CRITERIA"

1. The radiation protection criteria proposed in the consultative document appear to be generally consistent with recommended international standards and with national guidance and regulations, including those of the U.S. In particular, the general objective sets the goal of protection of human health and the environment while recognizing the impracticality of striving for absolute safety.
2. Criterion 1 appropriately limits the predicted risks to human health and the effects on the environment from waste disposal to levels no greater than would be currently acceptable. The second sentence of Criterion 1 provides that the judgement of acceptability shall be based on radiological impacts to individuals irrespective of any national boundaries. This suggests that impacts to individuals would be the only basis for judging safety, even though Criterion 4 later provides for consideration of total releases from a repository. This criterion could be improved by adding "and on total releases of activity to the biosphere" to the end of the second sentence.
3. Paragraphs 83 and 84 appropriately note that retrievability should not be required after repository closure. The document is silent, however, on the advisability of maintaining retrievability before final closure. Some repository designs anticipate emplacement of waste in one portion of a repository while simultaneously mining and developing another part of the facility for later waste emplacement. Also, confirmatory testing is likely to be carried on within the repository until final closure. A retrievability provision might be considered a desirable precaution in case either repository expansion or confirmatory testing should produce information indicating that the facility might be unsafe.
4. Criterion 3 establishes a limit on the predicted radiation dose to any individual, excluding doses from unlikely disruptive events. This criterion then provides for a qualitative and, whenever practicable, quantitative evaluation of the risk associated with unlikely disruptive events. Appropriately, this criterion avoids a rigorous requirement for quantification of the risks of unlikely events. It might be necessary, however, to more clearly distinguish between "likely" and "unlikely" events. For example, climate change is unlikely in the near future, but is quite likely to occur over periods of tens to hundreds of thousands of years. The discussion accompanying the criterion could be improved by indicating which treatment (dose limit or risk estimation) is intended for such events.

5. The discussion following Criterion 3 notes the difficulties inherent in trying to project doses to humans far into the future. Perhaps the discussion should recommend that dose calculations be terminated when the uncertainties in the projections become so large that they are no longer useful for evaluating the acceptability of a proposed repository.
6. A limit on the total amount of radioactive material permitted to be released from a repository is an appropriate way to prevent a "dilute and disperse" approach to waste disposal. The specific release limit of Criterion 4 appears to be roughly equal to the cumulative release limit of the U.S. Environmental Protection Agency's (EPA's) environmental protection standards for high-level waste disposal, and should effectively restrict total population impacts to levels small in comparison with other natural sources of radiation exposure.
7. Criterion 5 requires that radiological impacts from disposal of high-level wastes be as low as reasonably achievable (ALARA). Several years ago, the U.S. Nuclear Regulatory Commission declined to adopt an ALARA requirement as part of its repository regulations because of the difficulties that were anticipated in carrying out ALARA analyses and because the cumulative release limits of the EPA standards were already so low that additional ALARA analyses would have little value. Since the release limit of Criterion 4 also restricts cumulative releases to a very low level, it might be appropriate to de-emphasize (or even delete) Criterion 5 of this document.