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EN/S/1221

Paris, 10th June 1988

To: All Members of the NEA Working Group on Scenarios

Dear Dan,

Please find enclosed the Summary Record of the meeting held in Paris on 9th-11th May 1988. As agreed at that meeting I also enclose a copy of the draft report by Dames & Moore reviewing research into the effects of long-term environmental change.

Best regards.

Claes

Claes Thegerström
Division of Radiation Protection
and Waste Management

cc. PAAG/DOC(88)4
PR/CF-CEC 16061-001-60

Mr. Dan GALSON

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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PERFORMANCE ASSESSMENT ADVISORY GROUP

Summary Record of the Second Meeting
of the NEA Working Group on the Identification and Selection of Scenarios
for Performance Assessment of Nuclear Waste Disposal

Paris, 9th - 11th May 1988

Present:

B. GOODWIN, Canada
P. ESCALIER DES ORRES, France
J. ALONSO, Spain
K. ANDERSSON, Sweden
D. BILLINGTON, United Kingdom
D. HODGKINSON, United Kingdom (Chairman)
B. THOMPSON, United Kingdom
R. CRANWELL, United States
D. GALSON, United States
C. THEGERSTRÖM, NEA

Item 1: Opening of the meeting. Remarks by the Chairman

1. The Chairman, Mr. David Hodgkinson, welcomed all the participants to this second meeting of the NEA Working Group on Scenarios. Three experts participated for the first time, Mr. J. Alonso, Spain and Mr. D. Billington and Mr. B. Thompson, United Kingdom. Excuses had been received from Mr. P. Zuidema, Switzerland, who could not participate at this meeting.

2. The Chairman in his remarks underlined that this was a small group and thus very suitable for informal and scientifically oriented discussions. He recalled that the NEA Performance Assessment Advisory Group (PAAG) had spent one day at its last meeting on topical discussion of scenarios. The draft report was presented at that meeting together with the Sandia-methodology on which the present draft is based and the simulation-approach under development by HMIP of UKDOE. Comments and questions from PAAG had been

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summarized in Appendix 3 of SEN/RWM(88)4. A major issue for this second meeting of the Working Group would be to address the comments received at the PAAG-meeting and in particular to try to clarify as far as possible the common basis for and principal differences between the two approaches discussed at the PAAG topical meeting on scenarios.

Item 2: Approval of the agenda

3. The proposed agenda was approved.

Item 3: Approval of the minutes of the last meeting [PAAG/DOC(87)8]

4. These minutes were approved without comments.

Item 4: Report from the Secretariat on developments since the last meeting

5. Mr. Thegerström from the NEA Secretariat briefly summarized developments since the last meeting, which was held in Paris, in October 1987. They included the preparation, by the Working Group Chairman, of a first draft report; the discussions by PAAG at the one-day topical meeting on 27th January 1988; the compilation and editing of a draft NEA Scenario Questionnaire Catalogue; and a Glossary (Items 7 and 8 on the agenda). Reports on the progress of work had been given to PAAG and to the NEA Radioactive Waste Management Committee (RWMC) at their meetings in January and March this year. Both committees had confirmed that a high priority was assigned to the NEA activities on scenarios.

Item 5: Reports from the participants

6. Participants were invited to report on recent activities of interest to the group and to discuss issues that they felt were of importance.

7. Mr. Galson, USNRC, reviewed developments in the USA. He said scenario identification will provide key input to the USDOE plans for characterisation of the Yucca Mountain site. He highlighted current considerations inside USNRC and gave a background to the draft "Guidance for Determination of Anticipated Processes and Events and Unanticipated Processes and Events". He proposed that a classification in driving processes and events and resulting processes and events might be useful. He thought that scenario development should not be used to mask uncertainty in conceptual models and for this reason he thought that features (like an undetected zone close to repository or a seal-failure) should be part of model uncertainty.

8. Mr. Goodwin discussed recent work at AECL on identification of Events, Features and Processes (EFP:s) as the first step in scenario development. He presented extensive lists of EFP:s for the vault, the geosphere and the biosphere. He stressed that the lists were given in a first version without detailed sorting or any screening at this stage. They had been developed by several people of different background within the Canadian Nuclear Fuel Disposal Programme. It was noted that the lists provided a very valuable input to the development, by the working group, of EFP-lists for the major disposal options.

9. Mr. Billington highlighted some items in the UK NIREX repository safety assessment programme. He said that scenario analysis was regarded to be at the root of the assessment process. Methodology is now being built up for the safety assessment of a deep repository. A mixture of deterministic modelling and probabilistic safety assessment will be used. Four broad categories of "scenarios" had been distinguished: (i) Groundwater transport; (ii) Gas generation/transport; (iii) Human intrusion and (iv) Disruptive events.

10. Mr. Escalier des Orres described recent work in France related to scenarios. He mentioned that the Goguel-report has given general criteria for the hydrological and geological stability of an acceptable site for radioactive waste disposal. The influence on safety of climatic conditions, vertical movements and seismicity has to be assessed. Geoprospective studies are well underway in France as well as the reconstitution and modelling of climatic conditions. Neotectonic studies are being performed in the center of France (Massif Central). Much work on seismicity has been done for reactor siting but the subsurface effects, i.e. effects on permeability in fractured rocks, would need to be studied further.

11. Mr. Alonso, ENRESA, gave an overview of the Spanish programme. Spent fuel will be stored for a few decades before disposal. The capabilities for performance assessments are now being built-up. ENRESA has just finished a report to get the construction permit for a LLW disposal site in the south of Spain. The facility concept is similar to that in France and the same safety assessment philosophy has been adopted. The postclosure phase assessment include a basecase scenario (ground-water transport) and intrusion scenarios (worker exposure, residential area on the site). Well-scenarios are not analyzed because there is no aquifer close to the repository.

12. Mr. Andersson discussed recent developments in the Swedish nuclear waste disposal programme. He mentioned that the facility for disposal of low-level waste (SFR) has recently been licensed and put into operation. Additional clarifications on the performance assessment of the silo-part have been requested by SKI, however. Selection of a few potential sites for the spent-fuel repository will be made 1992-93. The need for scenario development will be met by SKI and SKB in a joint project applying the methodology discussed by the NEA Working Group and based on the work at Sandia (see further Item 9 below). At present only general radiation protection criteria are applied in Sweden but specific regulatory criteria for nuclear waste disposal are being studied jointly by SKI and SSI within the nordic community co-operation and also in co-operation with Swiss authorities, HSK. The risk concept might be used within each scenario but probably without any attempts to total risk estimations due to the difficulties to assign scenario probabilities.

13. Mr. Thompson presented the UKDOE approach of time dependent probabilistic risk assessment. A draft report "A method of overcoming the limitations of conventional scenario-based risk assessments by using Monte-Carlo simulation of future environmental changes" had been sent to the members before the meeting. He described the new time-dependent "second generation" PRA-code, VANDAL, and preliminary results with simulation of the effects of climatic changes on the safety of a repository in a hypothetical deep site in chalk and also for a hypothetical shallow engineered trench facility in clay. He said that the VANDAL-code will be further developed to include all aspects of the environmental simulation (i.e. environmental

models, human intrusion models, repository and transport models). He developed his criticism of the scenario-approach and proposed that, while recognising the near-term need for "scenarios" the NEA should support the use of the simulation methodology as a more complete and consistent approach for future safety assessments.

14. In connection with and after the reports from the participants the group had a thorough and stimulating discussion. Each participant summarized his main observations and conclusions at the end of the meeting on the last day. It is not attempted in these notes to record all the facets of the discussions. Much of the discussion centered around the logical (intellectual) framework for the development of scenarios and the similarities and differences between the "scenario-approach" and the "simulation approach" as well as the scenario-concept as such and its proper definition.

15. There was general agreement that the first phase, i.e. identification and subsequent classification and screening of events, features and processes (or factors as some preferred to phrase it) is common to all approaches. It addresses the completeness-issue and provides the starting point to scenario development or system and problem definition (simulation approach).

16. It was less clear how far the approaches are basically the same in the next phase, i.e. "formation/screening of scenarios" or "system and problem definition". It was pointed out by Mr. Cranwell that the group at this stage should refrain from criticism of possible shortcomings of any of the approaches unless it can be based on solid knowledge of the methodologies. The effort should first be concentrated on trying to understand in detail what is basically being made at each phase of the approaches and comparative examples would be very valuable.

17. The scenario concept and the definition of a scenario was discussed frequently throughout the meeting. It was even proposed not to use the term scenario because it has been used in so many different senses and thus means different things to different users of the term. It was recognized however that eventually the group will have to come up with a consistent terminology for the systematic approach that it will propose.

18. In the discussion a distinction was made between a scenario and a scenario realisation (or alternatively: a scenario class and a scenario). A scenario realisation would imply the modelling of a postulated future with defined parameter values.

19. The introduction of time and the role of time sequences was discussed at several occasions. Further clarification seem to be needed to explain clearly how time could be looked upon in the general framework (as one of many parameters to be defined in the scenario realisation phase or as being considered in a broad sense already in the development of scenarios) and how it is treated in practical applications

Item 6: Presentation and discussion of the draft main report

20. Mr. Hodgkinson said that a first draft version of the main report had been discussed at the PAAG-meeting on 26th January. Many valuable comments had been received on that occasion and a minor revision of the draft had been

made for this second working group meeting. He pointed out that also this version is only a first draft for discussion and that major revisions and extensions are foreseen. In particular, the "history" of how scenarios have been developed and analysed in safety studies will be included as well as revised descriptions of the main approaches including the "simulation approach". Lists of factors (events, features, processes) for the major disposal concepts will also be further developed and classified.

21. The ambition is still to i) provide a general logical framework for scenario development that is broad enough to encompass the different approaches being discussed and ii) provide a practical tool that Member countries can use in their safety assessment studies. It was pointed out by Mr. Thegerström that the draft report had been well received by PAAG and that both PAAG and the RWMC have given its support to the general outline of what this working group will try to achieve. Discussions and work during the next year will show how far the ambitions can be fulfilled but there is reason to believe that the planned report could not only describe the state-of-the-art but also help advance it by providing an internationally developed "baseline" for the logical framework, the terminology and the practical applications.

22. The text of the draft report was briefly discussed and comments provided will be taken care of in the next revision.

Item 7: Discussion of the draft scenario questionnaire catalogue

23. Mr. Thegerström introduced the NEA draft scenario questionnaire catalogue. Apart from a brief summary and some editing it is a compilation of all questionnaire responses received until now. A few additional studies, for instance the seabed disposal safety assessment and the French LLW-repository assessment will be included in the final version. The draft has been sent to all PAAG-members with a request to provide comments/updates. These will be incorporated in the final version which will be a free-standing supplement of the main report. The distribution of the catalogue will have to be decided by PAAG.

Item 8: Discussion of the draft glossary

24. A tentative glossary had been drafted by the Secretariat. It was briefly discussed but it was recognized that it would not be very fruitful to go through the terminology in detail at this stage. It was decided to include discussions of terminology in the text of the revised draft of the main report and to develop a glossary appendix limited to the key-terms used in the report. General reference would be made to the IAEA Waste Management Glossary without including any of its terms unless a different definition would be needed.

Item 9: Presentation and discussion of proposal for a worked-out example

25. Mr. Andersson presented the proposal to apply the general scenario development methodology to the Swedish concept for disposal of spent nuclear fuel. The study would be managed jointly by the Nuclear Power Inspectorate, SKI and the Swedish Nuclear Fuel and Waste Management Co., SKB. It would be linked to the NEA Working Group by the participation of David Hodgkinson and

Bob Cranwell in the work and by regular reports of results and experiences back to the whole working group. A first working session with different experts is foreseen for this autumn. NEA will also be invited to participate.

26. The group discussed and commented on the proposal. It was felt to be very valuable to get this opportunity to apply the ideas of the working group in a practical case and the group welcomed the initiative. Some participants stressed the need for the participation of a broad group of experts in different scientific areas and that also a professional guidance in getting the group to work efficiently together (elicitation process, group orchestration techniques) could be very helpful.

27. The appropriate mode for a possible inclusion of the Swedish case study in the NEA report will be discussed at a later stage when the results are available. Scenario development work based on the methodologies discussed are underway also in the United Kingdom. The experiences will be reported back to the NEA working group to provide further input to its report.

Item 10: Summing-up. Plan and timetable for future work

28. A major revision and extension of the draft main report will be made by the Chairman in co-operation with the NEA Secretariat. The discussions held at this meeting, which could only briefly be recorded in these minutes, will provide a very valuable basis for this revision.

29. A tentative timetable is to complete the work during 1989 and to publish the report late that year or early 1990. Regular reports will be given to PAAG and the RWMC and a presentation of the work should be planned for the joint NEA/CEC/IAEA symposium on "Safety Assessment of Radioactive Waste Repositories" to be held on 9th-12th October 1989 in Paris.

30. The next meeting of the working group will be held on 10th-12th January 1989 in Paris. A special session (one day) on "scenario probabilities", possibly with an invited external expert, will be prepared for that occasion.

Item 11: Any other business

31. During the discussions different topics that might be suitable for a NEA workshop in the future were mentioned. A workshop on "Human Intrusion" has already been approved by the RWMC and it is tentatively planned for the early Spring 1989. Other suitable topics mentioned were "geoprospective studies and modelling" and "environmental change". They will be discussed and considered further at the next PAAG meeting, 24th-26th October 1988.