

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

August 6, 1980

INFORMATION REPORT

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For: The Commissioners
Thru: Executive Director for Operations
From: Harold R. Denton, Director
Office of Nuclear Reactor Regulation
Subject: DRAFT STAFF REVIEW OF THE HEIDELBERG REPORT
Purpose: To inform the Commissioners regarding our
analysis of the Heidelberg Report.

L. J. [Signature]

Discussion: We have completed our draft review of a report entitled "Radioecological Assessment of the Wyl Nuclear Power Plant" (herein after referred to as the Heidelberg Report - see Enclosure 1).* The Heidelberg Report has been the subject of previous Commission information papers dated December 1979 and January 30, 1980.** We have published results of our review in draft form both as a main report for the technical community (NUREG-0668, Enclosure 2) and as a summary report (NUREG-0658, Summary, Enclosure 3) for general public information. We plan to publish a notice (Enclosure 4) in the Federal Register to indicate the availability of the draft NRC staff review, and the NRC translation of the Heidelberg Report, and to solicit public comments on our draft review.

The Heidelberg Report, prepared by advisers to the Department of Environmental Protection of the University of Heidelberg, West Germany, assesses the environmental impact of a proposed pressurized water reactor to be built near Wyl, West Germany. The assessment is based largely on radionuclide source and transport models that are used by us in routine and special licensing matters.

*Note: In earlier drafts of this review, NRC staff referred to this report as the Wyl Report. However, the report is more commonly referred to throughout industry as the Heidelberg Report. This report conforms to the common reference, "Heidelberg Report."

**SECY 79-653, and 79-653A, respectively.

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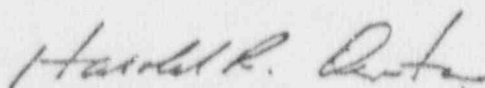
We reviewed the Heidelberg Report in detail because of the claims that we may be substantially underestimating doses to individuals living near nuclear power plants. Although the Heidelberg Report assessment is based largely on environmental models described in Regulatory Guides 1.109, 1.111, 1.112, and 1.113, the authors of the Heidelberg Report use values for some model parameters that are much higher than the values used by us. As a result, the dose estimates in the Heidelberg Report through some pathways are up to 10,000 times higher than the doses calculated using NRC parameter values. The Heidelberg Report documents its dose estimates by referring to over 200 references that were selected from scientific literature.

Most of the total dose estimates in the Heidelberg Report are due to ingestion of food contaminated with Cs-137 and Sr-90 from airborne releases. Consequently, we limited our detailed review to ingestion dose pathways from airborne releases. This review should not be taken as an endorsement of other parts (e.g., doses from liquid releases) of the Heidelberg Report that were not reviewed in detail.

Based on our in-depth review of the Heidelberg Report ingestion doses from airborne releases, we have concluded the following: (1) The actual amounts of radioactive materials that are released into the air from U.S. operating reactors are much less than the Heidelberg Report's estimated amount for the most significant radioactive materials. For example, the average measured release of the two nuclides (i.e., Cs-137 and Sr-90) from pressurized water reactors operating in the United States that account for most of the doses estimated in the Heidelberg Report was less than 1 percent of the corresponding source terms used in the Heidelberg Report. (2) Based on our review of the scientific literature, the Heidelberg Report values for the following critical parameters are unrealistically large: (a) soil-to-plant transfer factors for cesium and strontium; (b) the kidney dose conversion factor from ingestion of Cs-137, and (c) the bone dose conversion factor from ingestion of Sr-90. The NRC uses values for these parameters that are averages of the substantiated literature values or those used by the International Commission on Radiological Protection. The NRC values are much lower than those used by the Heidelberg authors. (3) There is positive evidence that the doses around nuclear power reactors sited in the United States are less than the values estimated in the Heidelberg Report.

This statement is based on measured environmental concentrations of Cs-137, the most crucial nuclide to the Heidelberg Report analysis, in vegetation, meat and milk, and on measured concentrations of I-131 in milk around reactors in the United States. The NRC staff reviewed the environmental monitoring data of 18 nuclear power plants, arbitrarily selected out of about 50 plants sited within the United States. In all cases, the average measured environmental concentrations near U.S. reactors lead to dose estimates that are much less than those estimated in the Heidelberg Report analysis of the Wyhl nuclear reactor.

On June 27, 1980, members of the NRC staff met with Bernd Franke and Barbara Steinhilber-Schwab of the University of Heidelberg staff. Although this meeting was held primarily to discuss the report "Radiation Exposure Due to Venting TMI-2 Reactor Building Atmosphere", by Bernd Franke and Dieter Teufel, some discussion was held on the draft NRC staff review of the Heidelberg report. The Heidelberg staff intends to provide written comments to NUREG-0668. This may delay the final document somewhat, since they felt it would take them longer than the issued 60 day comment period. We agreed to accommodate their time problem provided the time was reasonable.



Harold R. Denton, Director 7/24/80
Office of Nuclear Reactor Regulation

Enclosures: *Commissioners, SECY, PE & GC only.

- *1. Revised Translation of "Radioecological Assessment of the Wyhl Nuclear Power Plant" (NRC Translation 520)
- *2. Draft NUREG-0668
- *3. Draft NUREG-0668, Summary
- 4. Draft Federal Register Notice

Contact:

Edward Branagan, NRR, Ext. 27594.

UNITED STATES NUCLEAR REGULATORY COMMISSION

Notice of Availability of Draft NRC Staff Review
Of The "Heidelberg Report"

The staff of the Nuclear Regulatory Commission (NRC) has completed a draft technical review of a report prepared by advisers to the Department of Environmental Protection of the University of Heidelberg, entitled "Radioecological Assessment of the Wyhl Nuclear Power Plant" (Heidelberg Report). The purpose of this notice is twofold: (1) to give notice that the NRC staff draft review is available to the public; and (2) to solicit comments on the draft review.

The results of the staff review have been published in draft form for public comment, both as a main report for the technical community (identified as NUREG-0668) and as a summary report for general public information (identified as NUREG-0668, SUMMARY). Requests for single copies of the "Staff Review of 'Radioecological Assessment of the Wyhl Nuclear Power Plant'" (identified as NUREG-0668, or NUREG-0668, SUMMARY), and "Radioecological Assessment of the Wyhl Nuclear Power Plant" (identified as NRC Translation 520) should be addressed to the U.S. Nuclear Regulatory Commission, Washington, D. C., 20555, ATTN: Director, Division of Systems Integration.

A summary of the NRC staff review follows:

SUMMARY OF THE NRC STAFF REVIEW OF
THE HEIDELBERG REPORT

The staff of the Nuclear Regulatory Commission (NRC) has reviewed a report known formally as the "Radioecological Assessment of the Wyhl Nuclear Power Plant", and informally as the "Heidelberg Report".*

*In earlier drafts of this review, NRC staff referred to this report as the Wyhl Report. However, popular reference to this report has established the document as the Heidelberg Report.

This report was written by advisers to the Department of Environmental Protection of the University of Heidelberg, Germany. It presents an assessment of the environmental radiological impact of a proposed pressurized-water reactor to be built near Wyhl, West Germany.

The assessment is based largely on mathematical models that are used to calculate doses to humans in the area surrounding a reactor site and describe the movement of radioactive materials in the environment. These are the same mathematical models that are used by the U.S. Nuclear Regulatory Commission (NRC) in licensing reactors in the United States. The NRC uses these models to calculate doses to ensure that any radiation exposure due to an operating reactor is far below national and international recommended "safe" levels, and also well below natural background radiation levels.

The NRC staff reviewed the Heidelberg Report because the report implied that the NRC may be substantially underestimating doses to individuals living near nuclear power plants by using incorrect values for parameters in the mathematical models. Although the Heidelberg Report assessment is based largely on environmental models described in four NRC Regulatory Guides, the NRC staff's review of the Heidelberg Report indicates that the Heidelberg authors used values for some model parameters that are too high.

As a result, the Heidelberg Report estimated doses to the public by some pathways that are up to 10,000 times higher than the doses calculated using the NRC values for those models parameters. The Heidelberg Report documents the parameters chosen for the dose estimates by referring to over 200 documents selected from the scientific literature.

The NRC staff's review of the Heidelberg Report concluded the following:

(1) The average actual measured concentrations of radioactive materials near U.S. nuclear power plants lead to dose estimates that are much lower than those estimated in the Heidelberg Report for the Wyhl nuclear power p . . .

(2) The actual amounts of radioactive materials that are released into air from U.S. operating reactors ^{are} ~~is~~ much less than the Heidelberg Report estimated amounts for the most significant radioactive materials. For example, the average actual measured releases of the two most significant radioactive materials in the Heidelberg Report, cesium-137 and strontium-90, from U.S. operating pressurized water reactors have been less than 1 percent of the corresponding amounts assumed in the Heidelberg Report.

(3) The Heidelberg Report uses values for several critical parameters in the mathematical models used to calculate doses that are equal to or higher than the highest values derived from the references cited in their report. For example, the following values in the Heidelberg

Report are, in general, equal to or higher than the highest values cited in their references: (a) the numbers used to calculate the amount of cesium assumed to be absorbed from the soil by plants such as leafy vegetables and grass, (b) the numbers used to calculate the amount of strontium assumed to be absorbed by plants from the soil, (c) the number used to calculate the dose to the bone resulting from eating food or drinking liquids containing strontium-90, and (d) the number used to calculate the dose to the kidneys resulting from eating food or drinking liquids containing cesium-137. The NRC uses values for these parameters that are averages of the substantiated literature values or those used by the International Commission on Radiological Protection. The NRC values are much lower than those used by the Heidelberg authors.

(4) The Heidelberg Report values for some critical parameters are unsubstantiated. For example, the Report does not justify, either by reference or textual comment, its assumed values for the amount of cesium-137 absorbed into the kidney and the amount of strontium-90 absorbed into the bone. These values are much higher than the values NRC uses which are based on well known sources.

Interested persons may submit comments on the NRC draft report for the NRC staff's consideration. Comments are due by _____, 1980. Comments should be addressed to the Director, Division of Systems Integration, at the address below:

Denwood F. Ross, Jr., Director
Division of Systems Integration
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

After an analysis of comments on the draft report, the staff will issue a final report.

Dated at Bethesda, Maryland, this _____ day of June, 1980.

FOR THE NUCLEAR REGULATORY COMMISSION

William E. Kreger, Assistant Director
for Radiation Protection
Division of Systems Integration
Office of Nuclear Reactor Regulation