



Westinghouse
Savannah River Company

P.O. Box 818
Aiken, SC 29802

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April 23, 1990

Dr. Walter Kato, Chairman
Department of Nuclear Energy
Brookhaven National Laboratory
Building 197C
Upton, New York 11973

Dear Dr. Kato:

An Independent Scientific Review Committee was established by the Brookhaven National Laboratory (BNL) Department of Nuclear Energy in order to obtain an external scientific assessment of BNL's Marshall Islands Radiation Safety Program.

The following accepted BNL's invitation to participate:

1. Roscoe M. Hall (Chairman), Advisory Scientist, Health Protection, Westinghouse Savannah River Company
2. Norman Cohen, Professor and Director, Laboratory for Radiological Studies, New York University Medical Center
3. Keith Eckerman, Group Leader, Metabolism and Dosimetry Research Group, Oak Ridge National Laboratory
4. Henry Kohn, Professor Emeritus - Berkeley
5. Leonard Newman, Head, Environmental Chemistry Division, Department of Applied Science, Brookhaven National Laboratory
6. Hylton Smith, Scientific Secretary, International Commission on Radiological Protection

A packet of materials was sent to the members on March 5, 1990. The list of materials contained in that packet is given as Appendix A.

The Committee met at Brookhaven National Laboratory on March 26th and 27th. (Dr. Cohen was unable to attend.) On the 26th the Committee was given detailed briefings on the BNL effort by members of the Marshall Islands Radiation Safety Program staff. An agenda for that meeting is given in Appendix B.

Harry Brown MV

Dr. WALTER KATO

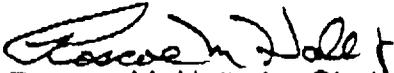
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On March 27th the Committee met in executive session to review the material presented and to prepare our report. The Committee agreed to insert Dr. Cohen's report within our report subject to review and consensus by mail. An oral summary of the Committee's findings was presented to Dr. Kato and Mr. Meinhold prior to leaving the site.

Dr. Cohen reviewed the whole body counting portion of the program on April 12, 1990 during a one-day visit to the Laboratory. His report was forwarded to the Committee. The final report is attached.

Yours very truly,



Roscoe M. Hall, Jr., Chairman
Scientific Review Committee

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Attachments (3)

MARSHALL ISLANDS RADIATION SAFETY PROGRAM

We reviewed the two radioanalytical methods (urine analysis for plutonium and whole-body counting for cesium) and the dosimetric models used by BNL to estimate the radiation dose to the Marshallese.

1. Urine Analysis. The Committee is convinced that the analytical data for urine collected in 1988-89 are valid. Previous estimates were in question owing to two factors:

(a) The analytical method used previously did not discriminate between plutonium and environmental ^{210}Po .

(b) The protocol for urine collection did not provide for contamination control.

Hence, analytical data for urine sample collected prior to 1988 should be discarded.

Current dose estimates are generally consistent with the U.S. Environmental Protection Agency (EPA), National Council on Radiation Protection and Measurements (NCRP), and International Commission on Radiological Protection (ICRP) recommendations.

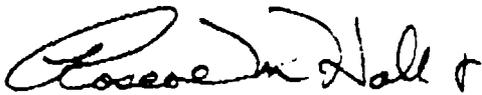
To provide some further assurance regarding the correctness of the plutonium procedure, we recommend the following:

- Check that ^{239}Pu does not adhere to the walls of the urine-sample container. Analysis of sequential acid washings should prove this point.
- Check the efficiency and variability of recovery by adding a spike of ^{239}Pu to an aliquot of a urine sample and comparing this with an unspiked aliquot.
- Exchange the urine samples with a laboratory.

2. Whole-Body Counting. Whole-body counting procedures used for estimating total body burdens of ^{137}Cs , ^{40}K and ^{60}Co , were generally within acceptable guidelines of technical excellence and conformed to recognized standards set for making accurate measurements of these nuclides in vivo. The basic methodology in use at the present time includes a detailed program of quality operation under difficult field conditions as well as the meaningful interpretation of data collected over a period of years. Plans for continued measurements to be made in the future should include the determination of calibration values and backgrounds for the whole-body counting of small children and infants. The quality assurance program should be continued.

To ensure the correct interpretation of ^{137}Cs body burdens it is recommended that "spot check" measurements be made of individuals in disposable paper suits as a comparison to those counts obtained with the subjects wearing their usual clothing. By this technique, external contamination can be quantified.

3. Other Comments. We recommend that estimates of intake and dose should include acute and chronic exposure patterns as appropriate for the individual or age group. The age groups should include infants and small children. In addition to ^{137}Cs and ^{239}Pu , the intakes and dose contributions from other radionuclides of potential interest, e.g., ^{240}Pu , ^{241}Pu , ^{241}Am , should be estimated. The estimates of intake and dose should be based on models and methods accepted by national and international experts as reflected in the recommendations of the ICRP (see Publication 48 and 56), the NCRP, and the EPA. Additional information and guidance can be obtained from such sources as the DOE Internal Dosimetry Performance Standard. Close coordination of these activities with personnel at LLNL and other experts should be continued. It is critical that a clear and concise presentation of the dosimetric analysis be completed in a timely manner. The quality assurance procedure for in-vivo and in-vitro analytical measurements were good.



ROSCOE M. HALL, CHAIRMAN
SCIENTIFIC REVIEW COMMITTEE
APRIL 23, 1990