

THIS DOCUMENT CONTAINS
POOR QUALITY PAGES

July 17, 1980

Dear Secretary

I have enclosed the original & two copies of our supplemental interrogatories. However, I am not including three copies of all the supporting evidence, but one.

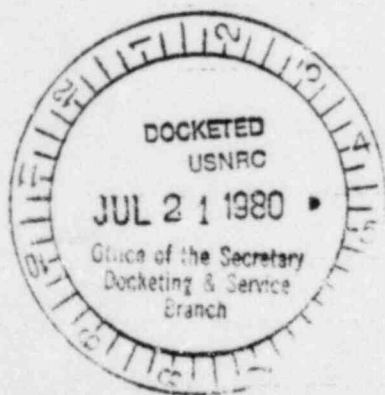
I assume you have the capabilities to make 2 copies of all the evidence, and can see that the remaining two Board members do obtain such data.

Thank you

Anne Morse

(608) 788-5537

RELATED CORRESPONDENCE



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CONFIDENTIAL



COMBINED EFFECTS OF RADIOACTIVE, CHEMICAL AND THERMAL RELEASES TO THE ENVIRONMENT



PROCEEDINGS OF A SYMPOSIUM
STOCKHOLM 25 JUNE 1975
JOINTLY ORGANIZED BY THE
IAEA AND NEA (OECD)



INTERNATIONAL ATOMIC ENERGY AGENCY, VIENNA, 1975

FOREWORD

A considerable increase in the number of nuclear power reactors and irradiated-fuel reprocessing plants will be required if the projected development of nuclear power up to the year 2000 is to be realized. The environmental implications of both a greater local concentration of power plants and a more widespread distribution of these throughout the world are being studied.

Since the operation of nuclear facilities results in the controlled release to the environment of small amounts of radioactive effluents, and these facilities and other industrial plants release in addition chemical and thermal effluents, attention must also be given to the study of the combined effects of such releases on environmental ecosystems. A better understanding of these effects is necessary in order to achieve the minimum 'detriment' to environmental quality from nuclear power development.

For many years extensive studies have been carried out on the impact on the environment of radioactive releases from the nuclear industry, particularly as they affect man. More recently, provoked by the forecast rapid development of nuclear power, scientists have also been studying the environmental effects of thermal and chemical releases from the nuclear industry separately.

The possibility of synergistic and combination effects from interaction of these releases and their significance in respect of man and his environment originally received little attention. However, during the past few years institutes in a number of countries have taken a more active interest in studies on combined effects, considering not only releases to aquatic environments, particularly rivers and lakes, but also releases to the atmosphere.

In order to provide an opportunity for assessing existing knowledge, the Agency, in co-operation with the OECD Nuclear Energy Agency, held a symposium on this subject in Stockholm from 2 to 5 June 1975. The symposium attracted 133 participants, representing 24 countries and nine international organizations. A total of 22 papers from 9 countries and one international organization were presented, and the meeting was concluded with a panel discussion that examined a number of important questions that had arisen concerning the combined effects of releases to the environment from the nuclear and other industries.

The need for such a meeting, and its particular value as a forum for exchange of information in this field, with application to all steam electric power plants and certain other industries, was evinced by the lively discussion generated by the presentation of the papers, and these also emphasized the breadth of interest, involving, as it does, representatives of numerous scientific disciplines.

It is hoped that these Proceedings, which include the full texts of all the papers, the discussions on individual papers and the panel discussion, will prove a useful addition to the library of information on environmental sciences.

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RE-ANALYSIS OF DATA RELATING TO THE HANFORD STUDY OF THE CANCER RISKS OF RADIATION WORKERS

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Pennsylvania,
United States of America

Abstract

RE-ANALYSIS OF DATA RELATING TO THE HANFORD STUDY OF THE CANCER RISKS OF RADIATION WORKERS

A study of workers in the nuclear industry who had linked records of external radiation doses and certified causes of death (1944-72 deaths of Hanford workers) was followed by a similar analysis of a larger sample of Hanford data (1944-77 deaths). The second study included our test which showed that, in surveys of the delayed effects of low-level radiation, comparisons between observed and expected doses of cancer cases (CMD method) are more informative than comparisons between observed and expected cancer deaths of exposed workers (SMR method). A second test (which took the form of a Mantel-Haenszel analysis and included exposure period and internal radiation among the controlling factors) showed that there were genuine differences between the radiation doses of two groups of certified deaths (cancer and non-cancer). Both studies produced evidence of a cancer hazard from low doses of external radiation even when delivered at low dose rates. According to the second study, approximately 5% of the cancer deaths of Hanford workers were radiation-induced, and these extra deaths were probably concentrated among cancers of tissues which rate high in the ICRP 14 classification of radiosensitivity (e.g. bone marrow, pharynx and lung, pancreas and small intestine).

A recent study of men and women who were repeatedly exposed to measured doses of low level radiation before dying of cancers and other causes (Hanford data) [1] has raised uncertainties about the cancer hazards of workers in the nuclear industry by producing risk estimates of a different order of magnitude from ICRP 26 recommendations [2]. The analysis of Hanford data was designed to take full advantage of the fact that for all badge monitored workers there were annual doses of external or penetrating radiation. It therefore followed unusual lines and was open to criticism by advocates of an alternative and more familiar method.

- 15 Safe Handling of Cadavers Containing Radioactive Isotopes (1953)
- 17 Permissible Dose from External Sources of Ionizing Radiation (1954) Including Maximum Permissible Exposure to Man, Addendum to National Bureau of Standards Handbook 59 (1958)
- 18 X-Ray Protection (1955)
- 19 Regulation of Radiation Exposure by Legislative Means (1955)
- 20 Protection Against Neutron Radiation Up to 30 Million Electron Volts (1957)
- 21 Safe Handling of Bodies Containing Radioactive Isotopes (1958)
- 24 Protection Against Radiations from Sealed Gamma Sources (1960)
- 26 Medical X-Ray Protection Up to Three Million Volts (1961)
- 29 Exposure to Radiation in an Emergency (1962)
- 31 Shielding for High-Energy Electron Accelerator Installations (1964)
- 34 Medical X-Ray and Gamma-Ray Protection for Energies Up to 10 MeV--Structural Shielding Design and Evaluation (1970)

The following statements of the HCRP were published outside of the

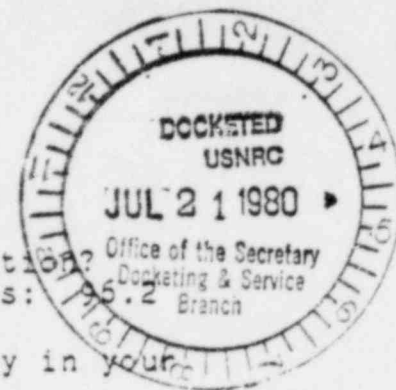
HCRP Report series:

- "Blood Counts, Statement of the HCRP," Radiology 63, 428 (1954)
- "Statements on Maximum Permissible Dose from Television Receivers and Maximum Permissible Dose to the Skin of the Whole Body," Am. J. Roentgenol., Radium Ther. and Nucl. Med. 84, 152 (1966), and Radiology 75, 122 (1960)
- "X-Ray Protection Standards for Home Television Receivers, Interim Statement of the HCRP" HCRP, Washington, 1968.
- "Specification of Units of Natural Uranium and Natural Thorium" HCRP, Washington, 1973

Copies of the statements published in journals may be consulted in libraries. A limited number of copies of the last two statements listed above are available for distribution by HCRP Publications.

Report Date: 4 JANUARY 1980
 State: WISCONSIN
 Number of member systems: 29
 Number systems reporting: 26
 Percentage reporting: 89.7

RELATED CORRESPONDENCE



PART A: ENERGY CONSERVATION-WEATHERIZATION ACTIVITIES

1. Has your board adopted a policy on energy conservation?
 No. Answering: 26 No. Yes: 25 % Yes: 96.2
2. Do you have a planned program for conserving energy in your own facilities?
 No. Answering: 25 No. Yes: 25 % Yes: 100.0
3. Do you have a board-approved plan and budget for energy conservation activities in 1980?
 No. Answering: 24 No. Yes: 15 % Yes: 62.5
4. Estimate how much your system will spend on energy conservation efforts in 1980:
 No. Answering: 24 Total: \$558,050 Avg/System: \$23,252
5. How many of your employees will work full time on energy conservation efforts in 1980?
 No. Answering: 26 No. Empl.: 16 Avg/System: 0.6
6. How many of your employees will work part time on energy conservation efforts in 1980?
 No. Answering: 26 No. Empl.: 111 Avg/System: 4.3
 No. Employees Full or Part Time: 127
7. Estimate the number of staff hours you will devote to your energy conservation programs in 1980:
 No. Answering: 26 Total Hours: 58,642 Avg/System: 2,255
8. Do your 1980 conservation plans include personal visits or energy audits to assist members?
 No. Answering: 26 No. Yes: 25 % Yes: 96.2
9. How many members of your staff have had training in home energy audits?
 No. Answering: 26 No. Empl.: 27 Avg/System: 1.0
10. How many home energy audits have been conducted by your staff at members' homes?

	No. Ans.	No. Audits	Avg/System
Prior to 1979:	26	940	36
During 1979:	24	262	11
Estimated 1980:	20	1,712	86
Total No. Of Audits:		2,914	
11. How many home energy audits have your members conducted themselves as a result of information or forms provided by you or in cooperation with another organization?

	No. Ans.	No. Audits	Avg/System
Prior to 1979:	14	217	16
During 1979:	14	157	11
Estimated 1980:	13	2,751	212
Total No. Of Audits:		3,125	

12. Please indicate how you are promoting energy audits or conservation:

	Exten.	Some	Not Any	E+S
System Newsletter:	8	8	4	16
Statewide Publ:	12	11	3	23
Bill Stuffers:	11	7	4	18
Pamphlets, etc.:	6	15	2	21
Media Ads:	4	13	5	17
Personal Contact:	8	16	0	24
Other:	5	2	0	7

13. Do you sell or install weatherization materials?

Sell: 7 Install: 0 Both: 2 Neither: 17
 No. Answering: 26 No. Sell/Install: 9 % Sell/Install: 34.6

14. If you sell or install, how many members used your weatherization sales/service program?

	No. Ans.	No. Members	Avg/System
Prior to 1979:	7	65	9
During 1979:	8	324	41
Estimated 1980:	5	500	100
Total No. Members:		889	

15. Do you have a home weatherization loan program?

No. Answering: 26 No. Yes: 12 % Yes: 46.2

16. Type of weatherization loan program:

FmHA: 7 CFC: 0 Gen Funds: 1 TVA: 0 Other: 1

17. How many home weatherization loans were made to your members?

	No. Ans.	No. Loans	Avg/System
Prior to 1979:	12	22	1.8
During 1979:	12	13	1.1
Estimated 1980:	9	25	2.8
Total No. Loans:		60	

18. Total amount of loans during 1979:

No. Answering: 11 Total: \$8,475 Avg/System: \$770

PART B: LOAD MANAGEMENT

1. Does your system have any type of load management program?

No. Answering: 26 No. Yes: 21 % Yes: 80.8

2. Kind of Load Control Program:

Direct Control: 14 Voluntary: 7

3(a). Type of Direct Control Equipment (No. Systems):

Radio: 5 Ripple: 2 Other: 7

3(b). Equipment Under Direct Control (No. Systems):

Dual Heat: 4 Heat Storage: 3 Water Heaters: 6
 Air Cond.: 0 Irrigation: 1 Other: 0

5. How many consumers have some load under control?

No. Ans: 14 Total Cons: 6,257 Avg/System: 447

Co-op 'Mockery'

I attended the Dairyland Power annual meeting as a delegate from Tri County Electric and have come away with feelings that must be similar to what disenfranchised minority groups must feel after attempting to speak out on an issue. Without a shadow of doubt, the meeting was so structured that no minority group had an opportunity to present data, facts or statistics supporting its case. The manager repeatedly attacked regulators and "well meaning, but ill informed alternative energy people," while in the next sentence he endorsed the wonders of nuclear energy and coal fired systems. The very fact that the podium was monopolized with pro-nuclear rhetoric without equal time to alternative energy systems, when in fact we obviously have a world wide serious economic, socio-political discussion going on regarding appropriate energy technology, suggests that the nuclear industry with its multi-billion dollar investment to protect, has fully infiltrated our annual meetings. I observed Dairyland staff and invited guests freely voting in the voice call votes with such enthusiasm that one can only believe that the entire voting procedure was a mockery of the democratic process, and a travesty against the official delegates' rights. We obviously need major scrutiny to determine just who is in control. Dairyland Power is supposed to be a co-op of co-ops and responsive to its membership.

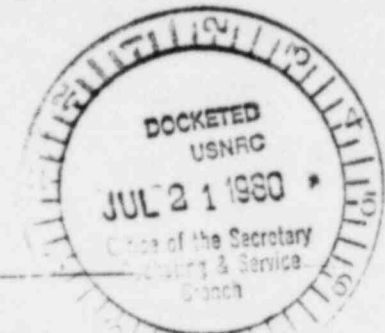
Yet it is impossible to believe that all sides of the energy issue have been fairly presented to the board or delegates for their independent decision on the direction of the co-op. By its own admission, the energy demands for 1979 were less than projected and at least conservation efforts along with wood may have played a major role in creating the demand shortfall. Logic would indicate that the membership in various ways is aggressively utilizing various alternative energy techniques. It would seem that their actions would signal Dairyland's board and management that their constituency is interested and is capable of understanding the pros and cons of the whole energy controversy. Yet management's opinions were so strongly stated supporting nuclear energy without opportunity for rebuttal that there was virtually no significant discussion regarding this highly sensitive and controversial energy issue. The direction of Dairyland should not be in the hands of management and technocrats or the nuclear industry, but in the hands of its membership. The Dairyland board should seek out all sides of the energy issue; present them fairly to its membership and then in the true spirit of the co-operative movement, continually assess what the people want and what the changing interests are.

I urge the board members to regain control of Dairyland Power. Listen to

...feelings from the membership, make independent decisions, and fully direct the management as to which course of action Dairyland should take in supplying our future energy needs. — James Miles, R. 1, New Albin, Iowa.

June 29, 80

RELATED CORRESPONDENCE



What Tribune readers say

Dairyland 'clique'

I was one of those in attendance with the Pierce-Pepin delegation at the recent Dairyland Power Cooperative annual meeting in La Crosse. Clearly, the meeting illustrated how far DPC's leaders and managers have strayed from their roots and from the spirit of cooperation.

The DPC system today is controlled by an entrenched clique of "good old boys" many of whom have been in power for 20-30 years. To maintain their reign, they've resorted to some of the dirtiest tactics I've ever seen, including the subversion of democratic processes.

Members who question co-op policies are labeled as "agitators" and are often harrassed. (A DPC official tried to block one member of our group from getting into the meeting!) Members who question the wisdom of having more of their money invested in risky nuclear power projects are labeled "emotional" and "hysterical" and "no-growth advocates who would lead us back to the simple life of a century ago." Members who want

their co-op to get serious about conservation and renewable energy are labeled "ill-informed." The sad thing is, co-op funding are being used in expensive propaganda campaigns to perpetuate this divisiveness.

The pressure to conform, to tow the "party line," is sometimes subtle and sometimes overt, but the message is always clear: dissension is not tolerated.

The handling of the resolutions at the annual meeting is a good case in point. An all-powerful resolutions committee, led by Elton Redalen, dictates to the delegates which resolutions are acceptable and which are not. There is an assumption or tradition that all resolutions endorsed by the resolutions committee must be endorsed by the body as a whole. Apparently no one is supposed to challenge their wisdom. Any objections raised are met with angry glares and sometimes open hostility.

The one resolution that did not come with the committee's blessing was that offered by Pierce-Pepin delegate Randy Freeman, concerning alternatives to a large, half-billion dol-

lar coal plant proposed by DPC management. It was an intelligent and thoughtful resolution, supported by thorough research of proven conservation and renewable energy strategies undertaken by other more progressive utilities. Freeman's contention is that there are less expensive, less environmentally destructive means of meeting future electrical energy needs and he simply wanted DPC to consider these alternatives before committing itself to another coal plant. Redalen blasted the resolution and with quick parliamentary maneuvering, discussion of it was "indefinitely postponed." Debate of the merits of the resolution itself was not allowed.

What a perfect way to stifle individual initiative and debate of substantive issues! The "good old boys," who thought the resolution was too "complex," were saved the trouble of having to think imaginatively.

I left the meeting feeling troubled and frustrated, but with the sense that we, as reform minded co-op members, have a big job ahead of us.

Patricia A. Wolff, Hager City.

6-27-80

\$1 -

EXCERPTS FROM

HOW RADIOACTIVE IS OUR MILK?

RELATED CORRESPONDENCE

The Urgent Need

for

Sound Monitoring and Public Disclosure



A report documenting the pervasive deficiencies in programs for the measurement of radioactivity in the environment, focusing on milk monitoring in the two leading dairy states: Wisconsin and California.

Another Mother Fund for Peace
407 North Maple Drive
Beverly Hills, California 90210

May 1979

Excerpts courtesy of:

League Against Nuclear Dangers (LAND)
Rt. 1 - Rudolph, Wis. 54475

ACKNOWLEDGMENTS

This study took over two years to complete, and the Another Mother Fund for Peace is indebted to many people who, recognizing the importance of the subject, gave generously their time and effort toward its completion.

The Another Mother Fund expresses gratitude to the following foundations whose financial support made this study possible: The D. J. B. Foundation, The LARAS Fund, The Max and Anna Levinson Foundation, The New York Community Trust, and The Youth Project. We appreciatively acknowledge the considerable financial help of the Environmental Council of the University of Wisconsin. In addition, we specially thank the hundreds of concerned citizens who made personal contributions ranging in amount from \$3 to \$5,000 in order to bring this project to completion.

During the first year of the study, Dr. Irving Lyon, an expert on the biological effects of radiation/radioactivity, served as Co-Director and Science Consultant. Dr. Lyon was formerly a full-time Special Consultant on nuclear matters to the California State Energy Commission. His thoroughgoing analysis of the Wisconsin and California milk monitoring data and related materials, as well as his intensive critical review of vital AEC/NRC, EPA and other government documents and reports seldom subjected to close scrutiny, provided a major part of our research findings. Throughout the summer of 1977, Lawrence Lyon worked diligently and capably as a research assistant in data analysis. Jemi Reis was efficient and dependable in her library research for the project.

During the second year of the study, Dr. Douglas DeNike, a consultant on nuclear matters for the Sierra Club and other public interest groups, took on major responsibilities as Research Associate. He did most of the research for and wrote Chapter IV on nuclear power plants, and did the meticulous research and writing of Chapter VII on health effects. The value to the project of his arduous and creative work as a researcher, writer, editor, and collaborator cannot be overestimated.

Barbara Royce, a talented researcher and former writer for Jacques Cousteau, using the research materials gathered and analyzed on the project, wrote the earlier chapters as well as other parts of the final report.

Dr. Martin Sperling, a nuclear specialist at Science Applications, Inc., prepared a special report for the study, the results of which are presented as a part of Chapter VII.

The research in Wisconsin was in the capable hands of Jeffrey Littlejohn, whose persistence and skill made it possible for us to obtain the milk monitoring data we needed from that state (his difficulties are detailed in Chapter VIII and its addenda). We are

indebted to many people who assisted the project in Wisconsin. Without the constant efforts of former Secretary of State Dr. Douglas LaFollette in prying open the doors of public-health officialdom, we would never have discovered what was behind those doors. We thank the Center for Public Representation in Madison, Wisconsin for its legal help in obtaining materials, with special thanks to James Bolgert, CPR legal intern. Assistance was also provided by Wisconsin Representative David Clarenbach, and by his staff aide, Dennis Dums. Lawrence McDonnell, Chief of the RPS, provided comments which are included in Chapter VI B.

Above all, in Wisconsin our close cooperation with the League Against Nuclear Dangers (LAND) proved of incalculable value. Gertrude Dixon, Research Director of LAND, contributed invaluable information, advice, and moral support as well as carefully reviewing the manuscript. Naomi Jacobson, Co-Director of LAND, cooperated in many ways and provided the State data on cancer deaths by health districts presented in Chapter VI.

We wish to thank Joseph Ward (Director) and Irving Goldberg (Senior Health Physicist) of the Radiologic Health Section, California State Department of Health Services, for their help in providing monitoring data and other information we requested. Special thanks is due to Dr. B. R. Tamplin, Director of the California State Sanitation and Radiation Laboratory, for the valuable information he made available and for his detailed review of Chapter VI A. Thanks to James Hanchett of the Nuclear Regulatory Commission for facilitating our requests for information and documents.

We are indebted to many scientists with whom we discussed the specific data used in this report. Those to whom we owe particular thanks include Dr. Rosalie Bertell, who critically reviewed many of our findings, and commented on most of the report at successive stages of revision; Dr. John Gofman (especially for his help on Chapter VII); Dr. Linus Pauling (who reviewed Chapter VII); Dr. Ernest Sternglass (for help, encouragement, and comments on Chapters II and IV); and Dr. Arthur Tamplin for his suggestions on Chapter II. Gregory Minor of MHB Technical Associates, a former executive in General Electric's nuclear division, gave us the benefit of his criticism of Chapter IV on nuclear power plants. Dr. George Dixon gave freely of his time and made many helpful suggestions, particularly with regard to our work in Wisconsin.

Thanks are due to Gene Schrader for her excellent editorial help. And we are grateful to Margie Bresnahan and Flora Dalmasse for their efficient typing of the manuscript. And to Marge Smolens for her careful proofreading. The charts and maps were prepared by Robin Greaves and Louise Katz Sullivan.

We express appreciation for candid discussions with many people responsible for milk monitoring duties at the Eau Claire, Green Bay, and Wausau monitoring stations in Wisconsin, the Red Wing station in Minnesota, and in California at Crescent City, Elk River, Fernbridge, Fort Bragg, Fortuna, Smith River, and Willits.

And most importantly, we give our sincere thanks for the frank and friendly responses of the dairy farmers around Genoa, Wisconsin and Eureka, California, the monitoring of whose milk was the central focus of our study.

Dorothy B. Jones
Project Director

PRINCIPAL FINDINGS

The two leading dairy states systematically neglect monitoring for radioactivity.

Existing monitoring programs for environmental media (food, water, air, etc.) are minimal in size and scope, and are inappropriately structured. Those who administer them fail to make their data sufficiently available. As a result, it is impossible for people to know with any confidence the degree of risk to which they are being exposed from radionuclides. Those who ask, "How radioactive is our milk?" can at present receive no trustworthy answers.

Our primary findings, further detail for which is given below and in the report proper, may be outlined as follows:

I. Present environmental radiological surveillance programs are woefully deficient (see Chapter V and its addendum, and Chapters VI, VI A, VI B, and VI C).

II. Supposedly public monitoring information is in fact not readily available to the public, and frequently its release is actively obstructed by the responsible governmental agencies (see Chapter IV, addendum IV-1, addenda VI C-1 and 4, Chapter VIII and especially its addenda).

III. The onsite and offsite monitoring programs of nuclear licensees are not sufficiently audited or supported by other programs. The effluent reports of nuclear power plant operators are delayed, fragmentary, and unverifiable (see Chapter IV and its addenda; also Chapters VI, VI A, and VI B).

IV. On orthodox assumptions, manmade radionuclides in the diet are calculated to induce dozens of cancers annually in the two leading dairy states, Wisconsin and California (see Chapter VII Table VII-1, and Addenda VII-1 and 2). On the basis of plausible assumptions suggested by recent research, the cancer incidence in the two states

due to ingested radioactive substances (mainly strontium-90) could be 400 to 2500 per year (see Chapter VII, Tables VII-2 and VII-3). And the NRC has ruled that strontium-89 and 90 need no longer be monitored!

V. From the beginning, government's stewardship over the atom has often been negligent, secretive, and deceitful (see Chapters III and VIII). Partially as a result of such policies and practices, vitally needed research on the health effects of radiation has been delayed or subverted, and federal exposure-dose limits are poorly founded, inconsistent, and to a large extent unenforceable (see Chapter II and its addenda). Major legislative reform is needed (see Recommendations).

* * *

I. State Programs.

Pervasive defects in state efforts for monitoring environmental radioactivity indicate unjustified complacency at best, corruption at worst (let the reader judge on the basis of the evidence amassed in Chapters V through VI C). State activities for monitoring milk and other media near California and Wisconsin nuclear power plants (conspicuous for potential radiological hazard) are not full-scale, but rather are minimum "audit" programs. Some of their dubious features are prescribed by the federal Nuclear Regulatory Commission, which provides part of their funding by contract with state health departments.

Milk samples for analysis by the states are collected, prepared, and forwarded by or under the supervision of nuclear-utility employees. Prescribed milk sampling frequency at the dairy farms near the nuclear plants (farms selected by the utilities) is four times per year. This quarterly sampling is substantially less often than federal regulatory guidance for the proper and timely detection of ephemeral iodine-131 releases.

Despite the state programs' ostensible purpose of "auditing" the nuclear utilities' monitoring practices, neither state issues formal evaluations of the power companies' monitoring. In both states, consistent discrepancies between utility and state data have remained uninvestigated and unreconciled over periods of years (see Chapter V and its addendum). Gross deficiencies in radiological laboratories' analytical competence have been documented by the Environmental Protection Agency (see Chapter VI), and our investigation revealed the conduct of the Wisconsin laboratory in particular to be shockingly poor (see Chapter VI C).

II. Lack of Disclosure.

Public access to existing environmental monitoring data is impeded in both states by minimal publication policies. Delays of up to a year intervene between the time a given sample is taken and the formal appearance of that sample's analytical results. Our review of monitoring by the Wisconsin Section of Radiation Protection (RPS) was actively resisted by a series of remarkable bureaucratic maneuvers reminiscent of the Watergate coverup (see addenda to Chapter VIII and Addendum VI C-4):

Our field representative, Jeffrey D. Littlejohn, was persistently obstructed in his efforts to study the public RPS files by the Chief of the RPS, Lawrence J. McDonnell (see Addendum VIII-1). Mr. McDonnell used numerous ploys to delay our obtaining the results of RPS's laboratory analytical performance in the EPA milk cross-check program (see Addendum VIII-2). He charged us 25¢ per page for duplicating RPS file documents, obliging us to spend nearly \$800 for the copying of RPS material necessary to our study (see Addendum VIII-3). And he apparently instructed an initially candid RPS laboratory technician to "clam up" (see Addendum VIII-4).

Officers of the Dairyland Power Cooperative, licensee of the LaCrosse nuclear power reactor, denied the existence of radioactive effluent release data previously described by other DPC personnel (see Addendum VIII-6). The Nuclear Regulatory Commission refused

to provide us with the daily effluent release data on Wisconsin power reactors, and was unresponsive to our requests for needed improvements in the NRC public document room for the LaCrosse plant (see Addendum VIII-7).

III. Utility Programs.

The monitoring and effluent-reporting programs which the NRC requires of its utility licensees are, in theory, the mainstay of public-health protection against contamination by nuclear power-plant discharges. However, these programs are themselves insufficient (see Chapter IV and its addenda):

--It is an astonishing fact that the power companies possess absolute proprietary secrecy rights over their daily radioactive effluent release data. The utilities are only required to periodically report to NRC the totals of such airborne and waterborne radio-nuclides emitted. Thus the accuracy of the annual totals published by the NRC is unverifiable. Moreover, the NRC has not, up to the present, imposed any detailed uniform format or scope for utilities' effluent reports. They vary markedly from plant to plant. The delay in publication is exemplified by the fact that the 1976 figures were published by NRC in March 1978 (see Chapter IV, reference #4).

--Contrary to federal regulatory guidance, there are few estimates of health effects anticipated from released nuclides in utility effluent reports (see Addendum IV-1).

--Unmonitored points of potential release or leakage at nuclear power plants, pointed out by EPA, add to the uncertainty of the reported totals (see Addendum IV-2).

--High releases, due to the commonly-experienced rupture of zirconium alloy fuel cladding in boiling-water reactors, sometimes persist for periods of years (see Addenda IV-4 and IV-5).

--The federal release "limits" are commonly relaxed to accommodate such heightened emissions; such limits bear no recognizable relation to plant size (see Chapter IV and

Addendum IV-3).

--Source-outlet monitoring of plant stacks and wastewater vents, coupled with mathematical dispersal and deposition models, are emphasized by NRC in preference to actual environmental monitoring. However, this practice is unscientific and unjustifiable, since studies reported by the Health Physics Society have failed to validate mathematical predictions (see Addendum IV-6).

Environmental monitoring of air particulates cannot substitute for milk monitoring, since different programs produce mutually inconsistent air data even within short distances of emissions sources (see Chapter V). In California, a state better instrumented than most, the adequacy of the air monitoring network has been questioned by a state-government task force (see Chapter VI A).

* * *

The upshot of the deficiencies summarized under I, II, and III above is that the nuclear licensees can release radioactivity to the environment without effectual watchdogging by either the states or the NRC. If a power company were to transgress its designated limits for stack and wastewater discharge of radionuclides, it could be fairly confident of escaping detection and punishment. Especially with regard to releases of short-lived, non-particulate radioactive isotopes such as iodine-131 and noble gases, the power companies not only possess formal licenses to run their reactors, they also have tacit licenses to pollute. Since the programs for surveillance of environmental radioactivity in the two leading dairy states have so many commonalities whose effect is to defeat their ostensible purpose, it is very difficult to believe that this was not in fact intended.

IV. The Health Toll.

Another Mother Fund for Peace made detailed calculations of the number of cancers

and genetic defects to be expected in California and Wisconsin from dietary iodine-131, cesium-137, and strontium-90 (see Chapter VII and its addenda). On the optimistic assumptions that the available milk monitoring data are fully accurate, and that radiological conditions will remain as they were during the interval 1970-1974, there will occur a total of not less than 50 cancers and 25 serious genetic defects per year in the leading dairy states from ingestion of food contaminated by these manmade nuclides. Moreover, calculations based on dose-effect assumptions developed by Dr. John W. Gofman (whose past predictions and recommendations have generally proved out very well) project more than 2500 malignancies annually for the two states, and not less than 175 serious genetic diseases each year. To the extent that poor monitoring has caused environmental radionuclide levels to be underestimated, the actual casualties may be even higher.

V. The Route to Reform.

Because of the constant neglect, dishonesty, and bureaucratic confusion which have characterized the regulation of radiation hazards over the years (see Chapters II, III, and VIII), comprehensive congressional and state legislative action is essential. In the Recommendations section which follows, we set forth the guiding principles and specifics for legislative and administrative reform.

Excerpts from: HOW RADIOACTIVE IS OUR MILK? The Urgent
Need for Sound Monitoring and Public Disclosure

by Another Mother Fund for Peace - Beverly Hills,
California - May 1979
Excerpts courtesy of League Against Nuclear Dangers,
Rudolph, Wisconsin

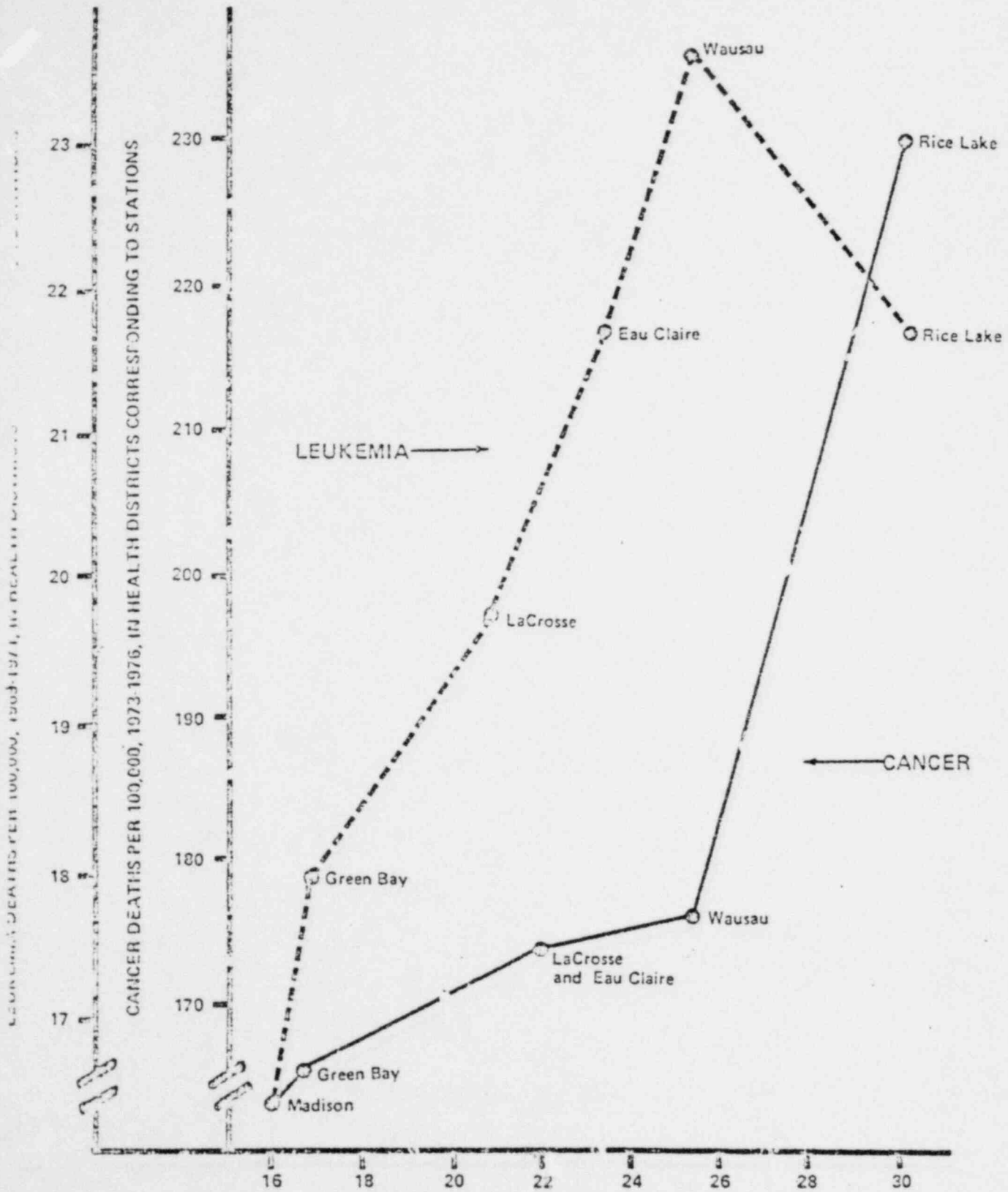
From Chapter VI regarding Leukemia, Cancer & Radioactivity in Wisconsin

We might expect the state health departments, in which the milk monitoring units are placed, to regularly correlate radionuclide levels in different areas with measures of morbidity and mortality -- that is, to investigate their impact on health. This is not a major activity of the California RNS or the Wisconsin RPS. Although persistent regional differences in radioactivity levels within California and within Wisconsin have been logged, and also persistent regional differences in cancer death rates, the state bureaucracies do not take the lead in relating the two.

Merely to illustrate the possibility of a causal relationship, we present Figure 4 and Table VI-3. These show statistically significant correlations between the 1963-1968 levels of strontium-90 in Wisconsin milk and subsequent deaths from leukemia and from cancer. Such indications as these (see also Chapter VII) clearly point to the need for further investigation by government agencies.

Such investigation might elucidate the relationship between radioactivity and health more clearly than has heretofore been the case, but the states do not vigorously pursue such studies. The prima facie meaning of the data of Table VI-3, graphed in Figure 4, is that strontium-90 in milk (plus, perhaps, unidentified variables coincidentally associated with Sr-90 levels) accounts for at least 69% of the variability in Wisconsin malignancy death rates.⁵ An additional interpretation suggested by the curves of Figure 4 is that, had Wisconsin received no deposition of radionuclides over the years, there would annually be at least 300 fewer leukemia deaths and 3,500 fewer cancer deaths -- which would represent drops of 39% and 46% respectively.⁶

FIGURE 4
STRONTIUM-90 AND MALIGNANCY MORTALITY RATES IN WISCONSIN



PICOCURIES PER LITER STRONTIUM-90 IN WISCONSIN MILK, 1963-1968, BY MONITORING STATIONS

Table VI-3

Relation of Mean Annual Strontium-90 Concentrations in Wisconsin Milk, by Sampling Stations, 1963-1968, to Leukemia Death Rates, 1969-1971, and Cancer Death Rates, 1973-1976, in Corresponding State Health Districts*

	Column 1	Column 2	Column 3
Wisconsin Radiation Protection Section (RPS) Milk Monitoring Stations	Average Sr-90 Concentration in Milk (picocuries per liter) (1963-1968)	Leukemia Death Rates, 1969- 1971 (per 10 ⁵ people)	Cancer Death Rates (all body sites) for 1973- 1976
Madison	15.9	16.4 (1 & 2)	162.8 (1 & 2)
Green Bay	16.9	17.9 (3 & 4)	165.1 (3 & 4)
LaCrosse	20.7	19.7 (5)	173.1 (5)
Eau Claire	23.3	21.7 (6)	
Wausau	25.3	23.6 (7)	177.7 (6)
Rice Lake	30.1	21.5 (8)	230.8 (7)

Correlations: Column 1 and Column 2: $r = 0.83$, p less than 0.05
 Column 1 and Column 3: $r = 0.88$, p less than 0.05

For either correlation, there is less than one chance in 20 of its occurring by coincidence alone.

Health District Numbers (in effect at the time) in parentheses. Note the State's consolidation of West Central and Western Districts, and renumbering, in Column 3.

Source of Data: State of Wisconsin Department of Health and Social Services, tabulated and forwarded by Naomi F. Jacobson and Gertrude A. Dixon, League Against Nuclear Dangers (LAND) Inc.

* Cancer death rates for combined health districts have been weighted to reflect the relative population of districts.

This chapter has briefly summarized why the present state programs do not constitute effective watchdogs. Billion-dollar dairying and farming industries can hence be subject to the same kind of unpleasant surprise -- radioactivity levels substantially worse than had previously been reported which befell southern Utah from nuclear weapons testing.⁷ With unnoticed small leaks, large accidents, and sabotage possible at nuclear facilities, we must have vigilant monitoring of foods. . . .

References

5. The square of the lower correlation, 0.83, is an accepted measure of the variance accounted for in the data.
6. The straight lines which best fit the data of Figure 4 are represented by the linear regression equations

$$L = 0.414S + 11.0$$

$$C = 4.183S + 89.7$$

where L is the leukemia death rate, S is strontium-90 level, and C is the total cancer death rate. The right-hand constants in these equations indicate the values of L and C which would be predicted if Sr-90 were 0, i.e., not present. Since the observed leukemia death rate statewide was 18.1 per 100,000 instead of 11.0, and since the observed cancer death rate was 167.6 rather than 89.7, it would appear that in the absence of Sr-90 there would be proportional decreases in the 800 leukemia deaths averaged per year between 1969 and 1971, and in the 7,668 cancer deaths per year between 1973 and 1976. Since eventually everyone dies from one cause or another, these differences should be viewed as differences in longevity rather than as total lives. The cancer mortality predictions developed on the basis of various dose-effect assumptions in Chapter VII and addenda are substantially lower. This suggests that there are additional causal variables adventitiously associated with Sr-90 levels, or that the dose-effect assumptions of Chapter VII are too optimistic, or that actual Sr-90 levels in milk have been proportionately underestimated by the Wisconsin RPS, or some combination of these.

7. See Chapter III. Moreover, as noted in Chapter VII, the health risks are even more widespread, since transported foods carry their long-lived radioactivity with them. One Californian connected with this study, whose consumption of Wisconsin cheese was high, accumulated an estimated 32,000 pCi body burden of Sr-90 from this source alone over 14 years.

Excerpt from a major report to be published
by Another Mother Fund for Peace, Beverly Hills, CA

Addendum VII-3: Special Contributors to Dietary Radioactivity Exposure Doses

Material in this addendum was adapted from Dixon et al.'s extended discussion of factors influencing the radionuclide exposure of special populations (1). The degree to which dietary differences can influence such doses is indicated by Garner (2):

"Local situations, again particularly dietary habits of both animals and man, have to be considered when attempting to predict the consequences of environmental contamination. It is clear that in the past the tendency to generalize has resulted in failure to recognize that there are local populations which may be at considerably greater--or for that matter, lesser--risk than the general population... An accurate estimate of the consequences of any specific contamination event can only be obtained by conducting a field study."

General topical considerations. Foods eaten fresh will contain more radioactivity, other things being equal, than foods purchased following processing and transportation from a distance. Thus, farm families eating fresh vegetables, fruits, berries, and milk, will have generally higher doses than city dwellers. It has also been observed that "...fresh fruit and vegetables...from local fruit or vegetable stands may also be a potentially important source of I-131" (2). Individuals who often consume foods without cooking or washing (e.g., wild berries) will ingest more radioactivity. Whole wheat products can contain almost twice the Sr-90 of white-flour products (2). Those who spend relatively more time outdoors will inhale relatively more radioactive particulates entrained in the air.

Soil and weather conditions can influence deposition of nuclides, their retention in soil, and uptake by plants and animals. For instance, Russell reports that "excepting lichens, the highest concentrations of fission products in plant forms were found in species grown in shallow water and marshes" (3). Thus foods whose production involves marshes (cranberries, rice, or animals which consume marsh hay) will contain higher concentrations. Radioactivity in lichens will affect wild game (see below regarding the special significance of venison for Wisconsin). Soils poorer in calcium will induce plants to absorb relatively more radiostrontium. Deposits of Cs-137 in light, sandy soils are more readily taken up by plants (2).

Radioactivity in drinking water. Even though water for drinking contains only one-twentieth the Sr-90 as milk (4) (and milk contains far less than alternative sources of equivalent calcium; see below), it has been estimated that 6% of the total intake of Sr-90 in New York City in 1966 was due to drinking water (2). Dixon and associates estimate that for Wisconsin, drinking water could contribute 6% to 20% of the total radionuclides ingested (1). The difficulty of keeping nuclides out of public water supplies is indicated by the fact that, in 1975, the EPA proposed to raise the permissible level of Sr-90 in drinking water from 2 pCi/l to 8 pCi/l (5). Should the entire population of the country ever ingest an average of 8 pCi/l of strontium-90 in its water, at least 350 additional cancers per year would result, as shown by the following calculation:

$$\begin{aligned} &220 \text{ million people} \times 0.75 \text{ l/day water consumption} \times 8 \times 10^{-12} \text{ Ci/l} \\ &\times 365 \text{ days} \times 744 \text{ cancers per Ci Sr-90 (see Chapter VII)} = 358 \end{aligned}$$

Alternatives to cow's milk are worse. Eisenbud points out (4) that supplying human calcium needs through cow's milk involves substantially less Sr-90 ingestion than if the needed calcium were obtained directly from food plants. This is so because "...the lactating animal has been shown to be a strontium decontaminator (relative to calcium) with

an efficiency of about 90%" (4). "...the calcium in (cow's) milk will be the least contaminated of all food sources of calcium" (6), according to one AEC study.

Increasingly, goats are raised for the convenience of smaller milk yields (for family consumption) for people not in the dairy business, and for the superior nutrition benefits ascribed to goat's milk. However, goat's milk will yield three to five times as much I-131, seventeen times as much Sr-90, and 25 times as much Cs-137 as will cow's milk (2). Dixon et al. estimate that if Wisconsin individuals were to have drunk goat's milk instead of cow's milk during the years 1963-1976, they would have accumulated a diet dose from fission products four times as high. This calculation is for fluid-milk consumption only (1).

Meats. Among meats, mutton and pork tissue will contain 2 and 6.5 times, respectively, the Cs-137 in beef tissue (2). Deer appear to concentrate Cs-137 and some other nuclides especially highly, and venison--obtained legally and by poaching--is a major dietary item in Wisconsin and similar game areas. A study at the Nuclear Fuel Services reprocessing plant (West Valley, N.Y.) estimated that the radiocesium ingested through venison could raise a person's whole-body dose from 1.7 mrem to as much as 257 mrem (7). The Dixon study advises, "Substitution in whole or part of venison for beef in the diet could probably raise the total-body dose from diet more than any other single factor" (1).

Wisconsin has extensive marshlands and moss or lichen ground cover which are well recognized as efficient radioactivity transfer agents. Most radionuclides are found in much higher concentrations in marshy plants than in dry-land plants. Compared to dry-land willow leaves, concentrations ranged from 1.8 to 8.6 times as high for various nuclides (Zn-65, Mn-54, Ce-144, Zr/Nb-95, Cs-137) in marsh-grown sphagnum moss (3). Research reviewed by Garner (2) concludes that 95% of Cs-137 deposits are retained; the "weathering half life" may be as long as 30 years. Also, 25% of the Cs-137 deposits on lichen and moss are absorbed by deer (4). In the West Valley study (7), one-third of the venison dose came from other nuclides. The Wisconsin health department has published no radiological data on Wisconsin venison. Such information would appear highly desirable. Lapps in northern Finland, who consume reindeer, were found to have radiation doses much higher than Lapps in southern Finland who eat other meats: Liver dose, 11.3 times as high; bone dose, 2.5 times as high; gonad dose, 12.1 times as high (4).

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