RES CONCURRENCE SHEET FOR CONTRACTS/GRANTS

DATE: August 22, 1995

FIN NO.: G6590 CONTRACT NO.: RES-95-086 (RES-C95-501)

CONTRACTOR/GRANTEE: NCRP

TITLE: Critical Evaluation of the Linear - No Threshold Assumption

/X / NEW /X / OTHER MODIFICATION TOTAL TERM: one year + 2
(award a grant to NCRP for one year with one two-year option)

FMPAS: Riggs MR DATE: 8/21/95

PM: C. Raddatz DATE:

BC: J. Glenn for JCG DATE: 8/21/95

MA: S. Hudson S. Hudson DATE: 8/21/95

D/DIR: F. Costanzi Bill M Morri for DATE: 8/21/95

FMPAS: C. Johnson-Dorsey cejd DATE: 8/21/95

RES:D: D. Morrison DM DATE: 8/21/95

I certify that funds are available for the above-referenced contract/grant in the amount of $ 75,000.00 for FY95.

for cejd
Norma M. Price, Certifying Official
FMB/FMPAS/RES

RECORD NOTE: The FAB has agreed to approve this grant on the conditions provided in attachment 3. If these conditions are not met by NCRP, the FAB withdraws its approval and the grant will not be awarded. See Background.

DISTR:
Subj: NEW GRANT NCRP 95-086
Proj Mgr: C. Raddatz, DRA
Div MA: S. Hudson, DRA
WYLBUR
FFS
Riggs desk copy

A/75

PLEASE NOTE: SEE MARIANNE RIGGS IF ANY CHANGES ARE NEEDED FOR THIS PACKAGE.

Date: August 22, 1995

PART I

U.S. Nuclear Regulatory Commission Request for Assistance Action (RFAA)		1. RFAA Number: RES-95-086 2. RFAA Revision No.: 3. Assistance Control No.:
Instructions:	This form is to be used for Federal Assistance requests to include grants and cooperative agreements	4. Type of Action Requested (check and complete as appropriate) [X] Execute a Grant to NCRP [ ] Execute a Cooperative Agreement [ ] Execute a Modification to a Grant Grant No.: Grantee _____ _____ [ ] Execute a Modification to a Cooperative Agreement Coop Agree No.: Cooperator _____ _____

5. Title and Brief Description of Work (50 Word Summary)

Critical Evaluation of the Linear - No Threshold Assumption

RES Document I.D. No.: RES-C95-501

6. Attachments (Specify)

1. Proposal from NCRP
2. Evaluation
3. Delimiters for placing this grant
4. Cost Considerations
5. FAB Approval memo

PART II 8/22/95

7. Funding

a. B&R Number	b. JOB CODE	c. APPN Number(s)	d. BOC
56015224015	G6590	31X0200.560	4110

e. FUNDS AVAILABILITY: This certifies that funds in the amount of $ 75,000.00 are available for obligation in the current budget for the described work.

8. SIGNATURE OF CERTIFYING OFFICIAL — DATE SIGNED

Cecelia L Johnson-Dorsey — 8/21/95

Norma M. Price, RES Certifying Official
Financial Management Branch, FMPAS/RES

9. PROJECT OFFICER'S NAME:	MAIL STOP:	TELEPHONE NO.:
Charleen Raddatz	T-9-C24	415-6215

10. REMARKS:
DC is requested to award a grant to NCRP for one year with one two-year option at $75K per year. Att. 3 should be incorporated into the grant. If all of the provisions in this attachment are not agreed upon by NCRP in their entirety, the grant shall not be awarded. In addition, the two-year option must be approved by the FAB at the end of the first year of the grant before the option can proceed.

Marianne Riggs, 415-5822, is the RES administrative contact for this RFAA. Please place Ms. Riggs on distribution for this grant.

The RES Document I.D. No., RES-C95-501, must be placed on all documents related to this RFAA.

11. SIGNATURE - Selecting Official or Representative — DATE SIGNED

SIGNED: Bill Morris — 8/21/95
NAME: Frank A. Costanzi
TITLE: Deputy Director
DIV: Division of Regulatory Applications
OFFICE: Office of Nuclear Regulatory Research

Proposal

To

U.S. Nuclear Regulatory Commission

to produce an NCRP report on the

Critical Evaluation of the Linear— No Threshold Assumption

April 1, 1995 to March 31, 1998

National Council on Radiation Protection and Measurements

7910 Woodmont Avenue, Suite 800

Bethesda, Maryland 20814

Contents

	Page
Technical Proposal Summary	1
Objective	2
Rationale/Task	3
Background on the NCRP	7
NCRP Procedures	9
Biographical Information on Selected Participants	12
Members of the Council	21
Collaborating Organizations	22
Special Liaison Organizations	23

TECHNICAL PROPOSAL SUMMARY

Submitted by:	National Council on Radiation Protection and Measurements 7910 Woodmont Avenue, Suite 800 Bethesda, Maryland 20814
Type of Organization:	A non-government, not-for-profit, congressionally chartered, public service, scientific and educational organization
Principal Investigator:	Charles B. Meinhold, President National Council on Radiation Protection and Measurements 7910 Woodmont Avenue, Suite 800 Bethesda, Maryland 20814
Telephone:	(301) 657-2652
Cost:	$225,000, $75,000 per year for three years
Institutional Administrator:	W. Roger Ney
Institutional Financial Officer:	W. Roger Ney
Date of Submission:	February 10, 1995

Objective[1]

The objective is to make a critical scientific assessment of all biological studies of the effects of ionizing radiation, and radiobiological theory of effects, in the low-dose and dose-rate region, *e.g.*, less than approximately 200 mSv and 10 mSv h^{-1} and then to summarize these effects.

[1]The NCRP is imminently qualified to perform this study as it has among its membership national experts in many fields to carry out its broad program in radiation protection and it can assemble the best scientific minds of national stature to serve on the committee to perform this assessment. In addition, the NCRP has the responsibility to meet the objectives of this study as given in its charter, see page seven. No other organization in the United States has this specific responsibility in its charter.

Rationale/Task[2]

Those responsible for establishing limits of radiation exposure for radiation protection purposes have assumed that at the low levels of dose relevant to radiation protection activities, the response of humans, as far as cancer induction or hereditary effects is concerned, is linear with no threshold. It has always been recognized, however, that this is an assumption and not a fact directly demonstrated by human epidemiological data nor uniformly supported by other biological data or theory.

Because the assumption of linearity plays such a vital role in our systems of radiation protection, both as a means of employing information available from human exposures at high doses and from a practical standpoint in facilitating exposure control, a critical examination of the scientific support, or lack thereof, for the assumption is warranted. The report to be prepared is aimed as such an examination.

The United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) has published two reports of particular relevance to this examination. Annex E of their 1993 report (UNSCEAR, 1993) reviews mechanisms of radiation carcinogenesis at low dose and low-dose rate. Their 1994 report (UNSCEAR, 1994) contains a section on low-dose epidemiology and a section on adaptive response. These reports, particularly the 1994 report,

---

[2] A study by the NCRP addressing this subject is timely in that there is considerable discussion taking place currently in the radiation protection community on adaptive response and radiation effects in general at low dose. This committee is not expected to specifically address risk estimates such as those derived from the survivors of Hiroshima and Nagasaki nor are they expected to specifically address the uncertainties in those estimates. However, the committee will perform a thorough assessment of the available information on radiation effects at low dose.

have raised questions of hormesis to the level of in-depth scientific analysis and will form an important aspect of the committee's reference material. The committee will also review the experimental data and the radiobiological theories of scientists who have varying opinions and theories on the response of biological systems to ionizing radiation in the low dose region.

It may be possible that definitive guidance on specific radiation protection assumptions at low dose could result, but a detailed exposition of what is known about the subject will, in and of itself, prove to be of major importance to all who have responsibilities that relate to radiation protection.

With the availability of funding, the NCRP will establish a scientific committee of national experts to conduct this assessment. It is anticipated that such a scientific committee would be comprised of recognized individuals with expertise in the scientific areas such as biophysics, genetics, DNA repair, experimental animal oncogenesis, dosimetry, radiation epidemiology, as well as operational radiation protection. It is anticipated that an additional 10 to 15 scientists with diverse opinion on the effects of ionizing radiation at low dose will be asked to present their views to the committee and to, therefore, serve as consultants to the committee. The consultants would not regularly attend meetings, but would most likely attend one meeting and have the opportunity to review the committee's report as it is developed. It may be effective to conduct a one or one and one-half day seminar where the consultants would be invited to present their views to the committee.

Such a committee would be expected to meet six to eight times during a three year period. The estimated cost of travel and secretariat support for such a committee is $75,000 annually. (A detailed budget will be provided on request).

References

UNSCEAR (1993). United Nations Scientific Committee on the Effects of Atomic Radiation. United Nations Scientific Committee on the Effects of Atomic Radiation, UNSCEAR 1993 Report to the General Assembly, with Scientific Annexes (United Nations Publications, New York).

UNSCEAR (1994) United Nations Scientific Committee on the Effects of Atomic Radiation. United Nations Scientific Committee on the Effect of Atomic Radiation, UNSCEAR 1994. Report to the General Assembly, with Scientific Annexes (United Nations Publications, New York).

Background on the NCRP

The National Council on Radiation and Protection and Measurements (NCRP) constitutes a unique organization in the area of radiation protection and measurement and its singular character contributes to effective implementation of the program covered by this proposal. The NCRP is chartered by the U.S. Congress and its Charter (Public Law 88-376) specifies the objects and purposes of the Council as follows:

1. "To collect, analyze, develop and disseminate in the public interest information and recommendation about (a) protection against radiation (referred to herein as "radiation protection") and (b) radiation measurements, quantities, and units, particularly those concerned with radiation protection;

2. To provide a means by which organizations concerned with the scientific and related aspects of radiation protection and of radiation quantities, units, and measurements may cooperate for effective utilization of their combined resources, and to stimulate the work of such organizations;

3. To develop basic concepts about radiation quantities, units, and measurements, about the application of these concepts, and about radiation protection;

4. To cooperate with the International Commission on Radiological Protection, the Federal Radiation Council, the International Commission on Radiation Units and Measurements, and other national and international organizations, governmental and private, concerned

with radiation quantities, units, and measurements and with radiation protection.

Another essentially unique feature of the NCRP is the fact that the scientists participating in the Council's program voluntarily contribute their time and energy in support of the Council's efforts. This makes available, at minimal cost, the collective understanding and ability of a large group of scientists of the first rank in the United States. Their ability and experience constitute the cornerstone of the Council's program.

The Council's mode of operation is designed to make maximum use of this contributed talent. The review of draft reports by all 75 members to utilize the wealth of expertise represented by the Council membership. The complexity of the issues involved in radiation protection and measurement activities mandates utilization of a system that can bring to bear a wide breadth of expertise and the NCRP's operation does this.

Another unique feature of importance to the utility and scientific validity of the NCRP reports is the structure of the relationships which the Council maintains with other organizations concerned with radiation protection and measurement. The Council has established a collaborating organization program which provides a mechanism for maintaining working relationships with organizations interested in radiation protection and measurement. Collaborating status provides means for the interchange of program information, ideas, and suggestions and the NCRP has found the input supplied by collaborating organizations valuable to its program. Collaborating organizations include scientific and professional societies and associations and governmental agencies. A list of the collaborating organizations is enclosed.

In addition to the collaborating organization mechanism, the NCRP has developed a structure of relationships to provide special liaison with many governmental bodies concerned with radiation protection and measurement. The special liaison relationship provides an opportunity for government agencies to comment on draft reports and potential new activities of the NCRP. A list of the special liaison organizations is enclosed. This mechanism broadens even further the expertise applied to review the Council's work. A special liaison organization of the NCRP employs individuals with technical expertise in radiation protection and measurements who can review and make recommendations regarding NCRP reports. A collaborating organization of the NCRP is any organization interested in the work of the NCRP.

NCRP Procedures

The NCRP has evolved, over the years, a method of operation which has been effective in accomplishing the work of the Council. The NCRP seeks to be always on the alert to identify areas in which the promulgation of recommendations can be of value to progress in radiation protection and measurement. Such areas are frequently brought to the attention of the NCRP by its Council members, by other individuals, by collaborating organizations, or by organizations interested in radiation matters. If the Board of Directors of the NCRP concludes that a study would be appropriate, the problem is either assigned to one of the existing committees or a new committee is constituted to examine the problem. The committees, or consist of from 5 to 15 individuals with particular expertise in the subject to be treated. These individuals are drawn from the nationwide pool of individuals with training and experience in radiation matters. If preliminary study justifies it, work is begun which typically involves a detailed examination of

pertinent information already available, an identification of areas in which information is meager or unavailable, and an assessment of the scientific thinking on the problem. Occasionally it is possible to fill gaps in the available knowledge through individual efforts on the part of committee members or to generate interest in others working in the problem area to obtain the needed information. The final result of the committees work is usually a draft of a proposed NCRP report. When the committee has essentially completed its work their draft report is entered into critical review. This often results in substantial changes to the draft report that result in significant improvement. Following critical review, the revised draft is then submitted to all the members of the Council so that the many disciplines and comprehensive experience represented by the Council membership may be brought to bear on the content of the report. Review by the members sometimes results in reconsideration by the committee and always results in substantial improvement of the proposed report. Finally, after Council approval is obtained, the report is ready for publication.

This method of operation has made it possible for the NCRP to publish more than one 100 NCRP reports which have often been accepted as the definitive statements on matters of radiation protection of radiation protection and measurement.

Judging by the wide acceptance of NCRP recommendations, it appears that this method of operation does, indeed, result in a synthesis of the present knowledge relevant to problems of radiation protection and measurement into practical recommendations of scientific merit.

NCRP Facilities

The nature of the work of the NCRP and the method of operation employed are such that the NCRP has no need for laboratory facilities or equipment. The only permanent facilities

necessary are office space and equipment, and library facilities, and these are already available. However, some library work has to be done at libraries outside of NCRP.

The committees of the NCRP require meeting space to carry on their work. Since meetings are held at locations which minimize expense and inconvenience for the members, meeting space is either made available by one of the members of the committee obtained at a local hotel, or the meeting is held in NCRP's facilities. The first meeting of all committee is held in NCRP facilities so that new committee members may become better acquainted with NCRP.

Key Personnel

NCRP utilizes the volunteered services of its 75 members and more than 500 adjunct members serving on scientific committees. Most of these individuals are nationally and internationally known and biographical sketches of many of them are available in scientific directories. The members of the Council and honorary members of the Council are identified in the following lists. Biographical information of selected staff to be involved in this project is also included.

RESUME

CHARLES B. MEINHOLD

Title: President

Role in Project: Principal Investigator

Personal Information

Birthdate: [redacted]
Sex: Male
Nationality: U.S.

Education:

Providence College, B.S., 1956
Radiological Physics, University of Rochester, Fellow, 1957

Experience

Brookhaven National Laboratory

Tenured Senior Scientist	1988-present
Division Head Radiological Sciences Division Department of Nuclear Energy	1988-1990
Senior Health Physicist and Division Head Safety and Environmental Protection Division	1972-1988
Staff Scientist Health Physics Division	1957-1972

Other Organizations

National Council on Radiation Protection (NCRP)
President, 1991-
Member, Board of Directors, 1980-86
Chairman, Scientific Committee 1 on Basic Radiation Protection Criteria, 1988-Present
Chairman, Scientific Committee 46 on Operational Radiation Safety, 1975-1989
Chairman, 1982, 1983, and 1984 Program Committees
Chairman, Ad hoc Task Group on Accident-Generated

Waste Water, 1986
Member, Task Force to Review NRC Recommendation on Occupational Exposure Levels

Member, Public Relations Committee
Member, 1981, 1985, and 1987 Program Committees
Member, Nominating Committee, 1986-Present
Member, Scientific Committee 80-1 on Hot Particles

International Commission on Radiological Protection (ICRP)

Member, Main Commission	1978-Present
Chairman, Committee 2 on Secondary Standards	1985-Present
Chairman, Committee 3 on Protection in Medicine	1978-85
Member, Committee 3 on Protection in Medicine	1973-78
Member Task Group on Protection Against Ionizing Radiation from External Sources	1967-70

International Commission on Radiation Units (ACCRUE)

Member, Task Group on Space and High-Energy Dosimetry

International Radiation Protection Association (IRPA)

President	1992-
Vice President	1988-92
Member, Executive Council	1984-88
Chairman, Long-Range Planning Committee	1984-88

Affiliations

American Academy of Health Physics
American Association of the Advancement of Science
American Nuclear Society
Health Physics Society
International Radiation Protection Association
New York Academy of Sciences
Radiation Research Society
Society for Risk Analysis

Publications (Selected List):

Meinhold, C.B. (1987). "Sources of exposure to the public," Trans. Amer. Nucl. Soc. **13**, 517-518.

Meinhold, C.B. (1974). "The unchanging aspects of radiation exposure limits," presented at the International Atomic Energy Agency Symposium, Vienna, Austria, IAEA-SM1985/19.

Meinhold, C.B. (1980). "The economics of risk and the ALARA approach in standards and setting," pages 77 to 82 in Quantitative Risk in Standards Setting, NCRP Proceeding No. 2 (National Council on Radiation Protection and Measurements, Bethesda, Maryland).

Casey, W.R., Bond V.P. and Meinhold, C.B. (1984). "The disparity between the amount of emergency preparedness for nuclear vs. other rare catastrophic events," Health Phys. **47**, 521-523.

Meinhold, C.B. (1987). "Radiation protection in a pluralistic society," Health Phys. **51**, 13-16.

Meinhold, C.B. (1988). "The impact of the probability of causation on the radiation protection program," Health Phys. **55**, 2, 375-377.

RESUME

W. ROGER NEY

Title: Executive Director, NCRP

Role in Project: Administers the NCRP Program

Personal Information

Birthdate: [redacted]
Place of Birth:
Sex: Male
Nationality: U.S.

Education:

Yale University, New Haven, Connecticut, B.S., 1957 Physics
George Washington University Law School, Washington, D.C., J.D., 1964

Research Interest:

Radiation Protection and Measurements

Experience

Executive Director, National Council on Radiation Measurements	1964-Present
Secretary, National Council on Radiation Protection Measurements	1962-Present
Executive Secretary, International Commission on Radiations Units	1962-Present
Scientific Assistant to Associate Director for Technical Support, National Bureau of Standards	1963-1964
Scientific Assistant to the Chief of the Radiation Division, National Bureau of Standards	1960-1963
Physicist, Optics and Metrology, National Bureau of Standards	1958-1960

RESUME

WILLIAM M. BECKNER

Title: Deputy Executive Director

Role in Project: NCRP Secretariat

Personal Information:
Birthdate: [redacted]
Sex: Male
Nationality: U.S.
Military: [redacted]

Education:

George Washington University, Washington, D.C., B.S., 1967
Johns Hopkins University, Baltimore, Maryland, Master Health Science, 1975

Certification:

American Board of Radiology - Medical Nuclear Physics, 1975

Professional Memberships:

American Association for the Advancement of Science
American Association of Physicists in Medicine

Experience:

Deputy Executive Director, National Council on Radiation Protection and Measurements	1993-Present
Senior Staff Scientist, National Council on Radiation Protection and Measurements	1991-Present
Staff Scientist, National Council on Radiation Protection and Measurements	1986-1991
Associate Staff Scientist, National Council on Radiation Protection and Measurements	1982-1986

Head, Radiation Health Section, Division of Environmental Protection and Occupational Safety and Health Office of the Chief of Naval Operations, (OP-455C)	1981-1982
Head, Radiation Health Branch, Undersea and Radiation Medicine Bureau of Medicine and Surgery	1976-1981
Head, Radiation Safety Service, National Naval Medical Center, Bethesda, MD	1975-1976
Head, Radiation Dosimetry Section, Bureau of Medicine and Surgery	1975-1976
Physicist, Division of Nuclear Medicine, Department of Radiology, National Naval Medical Center	1974-1975
Student, Johns Hopkins University, School of Hygiene and Public Health	1973-1974
Whole Body Counting Facility, Department of Radiology, National Naval Medical Center	1971-1973
Head, Medical Physics Department; Head, Data Processing Department 6/69-6/70, U.S. Naval Medical Research Unit No. 2, Taipei, Taiwan	1967-1971
Student, George Washington University, Washington, D.C.	1965-1967
Officer in Charge of Whole Body Counter and Radiation Safety Officer, U.S. Naval Medical Research Unit Number 2, Taipei, Taiwan	1962-1965

Technician in Charge of Whole Body Counting Equipment, Radiation Exposure	1960-1962
Evaluation laboratory, U.S. Naval Hospital Bethesda, Maryland Instructor, U.S. Naval Medical School, Bethesda, Maryland (Instruction of medical officers and enlisted technicians in clinical radioisotope procedures)	1956-1960
Hospital Corps, U.S. Navy	1953-1956

Consultant Positions:

George Washington University Medical Isotopes Program	1978-1979
Medical Isotopes Committee, National Naval Medical Center, Bethesda, Maryland	1975-1981
Princes Georges Community Hospital	1977-1978

Publications (Selected List):

Beckner, W.M. (1965). Installation of a Whole Body Counter at the United States Naval Medical Research Unit, No. 2., NAMRU-2 Report.

Strickland, G.T. and Beckner, W.M. (1968). "^{51}Cr studies in Wilson's disease," J. Soc. Nuc. Med. **6**, 353.

Strickland, G.T., Beckner, W.M. and Leu, M.L. (1970). "Copper absorption in Wilson's disease," Clin. Res. **17**, 465.

Leu, M.L., Strickland, G.T., Beckner, W.M., Chen, T.S.M., Wang, C.C. and Yeh, S.J. (1970) "Muscle copper, zinc and manganese levels in Wilson's disease: Studies with the use of neutron activation analysis," J. Lab and Clin. Med. **76**, 3, 432.

O'Reilly, S., Strickland, G.T., Weber, P.M., Beckner, W.M. and Shipley, L. (1971) "Abnormalities of the physiology of copper in Wilson's disease I. The whole-body turnover of copper," Arch. Neurol. **24**, 285.

Fidler, S.M., Beckner, W.M. and Sode, J. (1972) "Decreased calcium absorption (CaAb) on cholestrayamine therapy," Clin. Res. **20**, 544 and U.S. Navy Medicine, **69**.

Sode, J., Sabol, J.J., Beckner, W.M., Fidler, S.M. and Canary, J.J. (1972) "Whole body retention of orally administered 47-calcium," U.S. Navy Medicine, **59**.

Sode, J., Scrom, E.B., Jernigan, B.L., Beckner, W.M. and Moquin, R.B. (1962) "Total body potassium (K) as a reference standard for normality of red blood cell mass," U.S. Navy Medicine, **59**.

Heck, L.L., Beckner, W.M. and Duley, J. (1972) "Diagnosis of multiple small pulmonary emboli with ^{99m}Tc microsphere," U.S. Navy Medicine **59**.

Strickland, G.T., Chang, K.N. and Beckner, W.M. (1972) "Hypersplenism in Wilson's disease," Gut **13**,220.

Strickland, G.T., Beckner, W.M. and Leu, M.L. (1972) "Turnover studies of copper in homozygotes and heterozygoses for Wilson's disease and controls: Isotope tracer studies using copper-67 and copper-64," Clin. Sci. **43**, 617.

Watten, R.H., Beckner, W.M., Cross, J.H., Gunning, J.J. and Jarimillo, J. (1972) Clinical Studies of Capillariasis Philippinesis: Transactions Royal Society Tropical Medicine and Hygiene.

Wang, P.S. and Beckner, W.M. "Cesium-137 turnover rates in human subjects of different ages," Health Phys, **24**, 603-602.

NCRP Staff Assistant for published reports of NCRP scientific committees

1. NCRP Report No. 77 entitled, "Exposures from the Uranium Series with Emphasis on Radon and its Daughters" (1984).

2. NCRP Report No. 91 entitled, "Recommendations on Limits for Exposure to Ionizing Radiation" (1987).

3. NCRP Report No. 97 entitled, "Measurement of Radon and Radon Daughter Products in Air" (1988).

4. NCRP Report No. 96 entitled, "Comparative Carcinogenicity of Ionizing Radiation and Chemicals" (1989).

5. NCRP Report No 98, entitled, "Guidance on Radiation Received in Space Activities" (1989).

6. NCRP Report No. 103, entitled, "Control of Radon in Houses" (1989).

7. NCRP Report No. 106, entitled, "Limit for Exposure to "Hot Particles" on the Skin" (1989).

8. NCRP Report No. 104, entitled, "The Relative Biological Effectiveness of Radiations of Different Quality" (1990).

9. NCRP Commentary No. 6 entitled, "Radon Exposure of the U.S. Population - Status of the Problem" (1991).

10. NCRP Commentary No. 7 entitled, "Misadministration of Radioactive Material in Medicine-Scientific Background" (1991).

11. NCRP Statement No. 7 entitled, "The Probability That a Particular Malignancy May Have Been Caused by a Specified Irradiation" (1992).

12. NCRP Report No. 115 entitled, "Risk Estimates for Radiation Protection" (1993).

13. NCRP Report No. 116 entitled, "Limitation of Exposure to Ionizing Radiation" (1993).

14. NCRP Report No. 117 entitled, "Research Needs for Radiation Protection" (1993).

15. NCRP Report No. 119 entitled, "A Practical Guide to the Determination of Human Exposure to Radiofrequency Fields" (1993).

16. NCRP Commentary No. 9 entitled "Considerations Regarding the Unintended Radiation Exposure of the Embryo, Fetus or Nursing Child" (1994).

MEMBERS OF THE COUNCIL

January, 1995

	Term of Membership
Seymour Abrahamson	1991-1997
S. James Adelstein	1990-1996
Peter R. Almond	1990-1996
Larry E. Anderson	1994-2000
Lynn R. Anspaugh	1989-1995
John W. Baum	1993-1999
Harold L. Beck	1992-1998
Michael A. Bender	1993-1999
B. Gordon Blaylock	1990-1996
Bruce B. Boecker	1993-1999
John D. Boice, Jr.	1991-1997
Andre Bouville	1993-1999
John W. Brand	1994-2000
Robert L. Brent	1991-1997
A. Bertrand Brill	1991-1997
Antone L. Brooks	1991-1997
Paul L. Carson	1990-1996
Melvin W. Carter	1989-1995
James E. Cleaver	1994-2000
Fred T. Cross	1992-1998
Gail de Planque	1991-1997
Sarah Donaldson	1992-1998
William P. Dornsife	1994-2000
Carl H. Durney	1990-1996
Keith F. Eckerman	1990-1996
Charles M. Eisenhauer	1989-1995
Thomas F. Gesell	1989-1995
Ethel S. Gilbert	1993-1999
Joel E. Gray	1993-1999
Arthur W. Guy	1992-1998
Eric J. Hall	1994-2000
Naomi H. Harley	1994-2000
William R. Hendee	1991-1997
David G. Hoel	1992-1998
F. Owen Hoffman	1992-1998
Donald G. Jacobs	1989-1995
A. Everette James, Jr.	1991-1997

	Term of Membership
John R. Johnson	1992-1998
Bernd Kahn	1991-1997
Kenneth R. Kase	1993-1999
Amy Kronenberg	1993-1999
Harold L. Kundel	1990-1996
Charles E. Land	1993-1999
John B. Little	1991-1997
Richard A. Luben	1994-2000
Harry R. Maxon	1989-1995
Roger O. McClellan	1989-1995
Barbara J. McNeil	1989-1995
Charles B. Meinhold	1990-1996
Fred A. Mettler	1992-1998
Charles W. Miller	1994-2000
Dade W. Moeller	1991-1997
Gilbert S. Omenn	1992-1998
Lester J. Peters	1991-1997
Ronald Petersen	1993-1999
John W. Poston, Sr.	1990-1996
Andrew K. Poznanski	1989-1995
Genevieve S. Roessler	1990-1996
Marvin Rosenstein	1994-2000
Lawrence N. Rothenberg	1992-1998
Michael T. Ryan	1992-1998
Keith J. Schiager	1989-1995
Roy E. Shore	1989-1995
Kenneth Skrable	1994-2000
David H. Sliney	1992-1998
Paul Slovic	1993-1999
Richard A. Tell	1989-1995
William L Templeton	1991-1997
Thomas S. Tenforde	1994-2000
Ralph H. Thomas	1990-1996
John E. Till	1990-1996
Robert L. Ullrich	1994-2000
David Weber	1993-1999
F. Ward Whicker	1992-1998
Marvin C. Ziskin	1993-1999

COLLABORATING ORGANIZATIONS

Organization	Individual(s) Designated to Provide Liaison
American Academy of Dermatology	Dr. Robert O. Gorson
American Academy of Environmental Engineers	William Anderson
American Association of Physicists in Medicine	Dr. Edward W. Webster
American College of Medical Physics	Dr. Lawrence N. Rothenberg
American College of Nuclear Physicians	Dr. Barbara J. McNeil
	Dr. Myron Pollycove
American College of Occupational and Environmental Medicine	Dr. Thomas Ely
American College of Radiology	Mr. Otha W. Linton
American Dental Association	Dr. Robert J. Nelsen
	Dr. Charles M. Schoenfeld
American Industrial Hygiene Association	Mr. George M. Wilkening
American Institute of Ultrasound in Medicine	Dr. Marvin C. Ziskin
American Insurance Services Group	Mr. Gerald E. Lingenfelter
American Medical Association	Dr. Jerod Leob
American Nuclear Society	Carl Unruh
American Pharmaceutical Association	John Hammond
American Podiatric Medical Association	Dr. Glen Gastwirth
	Dr. Pamela Colman
American Public Health Association	Dr. William H. McBeath
American Radium Society	Dr. Robert O. Gorson
American Roentgen Ray Society	Dr. Eugene L. Saenger
	Dr. Hymer L. Friedell
American Society of Hospital Pharmacists	Joseph Oddis
American Society of Radiologic Technologists	Ward M. Keller
American Society for Therapeutic Radiology and Oncology	J. Frank Wilson
Association of University Radiologists	Dr. Donald R. Kirks
Bioelectromagnetics Society	Dr. Edward L. Alpen
College of American Pathologists	Myron Pollycove
Conference of Radiation Control Program Directors, Inc.	Dr. Melvin W. Carter
Council on Radionuclides and Radiopharmaceuticals	Dr. L. Smith
Electric Power Research Institute	Dr. Richard E. Balzhiser
Federal Communications Commission	Dr. Robert Cleveland
Federal Emergency Management Agency	Mr. Marlow Stangler
	Mr. Carl Siebentritt
Genetics Society of America	Dr. Seymour Abrahamson
Health Physics Society	Dr. Keith J. Schiager
Institute of Nuclear Power Operations	Mr. William Kindley
International Brotherhood of Electrical Workers	Mr. William F. Paul
National Aeronautics and Space Administration	Frank M. Sulzman
National Association of Environmental Professionals	Susan Eisenberg
National Electrical Manufacturers Association	Mr. James E. Howard
National Institute of Standards & Technology	Dr. David Gilliam
Energy Institute	John Schmitt
Oil, Chemical & Atomic Workers	Charles Barrett
Radiation Research Society	Dr. Edward R. Epp

COLLABORATING ORGANIZATIONS (CONT'D)

Radiological Society of North America	Dr. Fred A. Mettler, Jr.
Society of Nuclear Medicine	Dr. S. James Adelstein
United States Air Force	Major Don Jordan
United States Army	Lt. Col. Peter Myers
United States Coast Guard	Captain Michael Adess
United States Department of Energy	Dr. Harry J. Pettengill
United States Department of Housing and Urban Development	Mr. Joel Segal
United States Department of Labor	Dr. Sheldon Weiner
United States Department of Transportation	Michael Wangler
United States Environmental Protection Agency	Ms. Margo Oge
United States Navy	Captain James Malinoski
United States Nuclear Regulatory Commission	Stewart Schneider
United States Public Health Service	Dr. Marvin Rosenstein
Utility Workers Union of America	John M. Walsh, Jr.

GOVERNMENTAL ORGANIZATIONS
PARTICIPATING IN
SPECIAL LIAISON PROGRAM

Organization	Name, Address and Telephone of Representative(s)
Australian Radiation Laboratory	Dr. Keith H. Lokan Director Australian Radiation Laboratory Lower Plenty Road Yallambie Victoria 3093 Australia
Commission of the European Communities	Commission of the European Communities Biology Division Rue de la Loi 200 B-1049 Brussels Belgium
Commissariat A L'Energie Atomique	Dr. H. Jammet Republique Francaise Commissariat A L'Energie Atomique Institut de Protection et de Surete Nucleaire 92260 Fontenay aux Roses France
Defense Nuclear Agency	Dr. David Auton Defense Nuclear Agency 6801 Telegraph Road Alexandria, Virginia 22310 Telephone: 325-7060

Health Council of the Netherlands	Wim Passchier Deputy Executive Director Health Council of the Netherlands P.O. Box 90517 2509 LM the Hague The Netherlands
International Commission on Non-Ionizing Radiation Protection	Dr. Micahel H. Repacholi Chairman International Commission on Non-Ionizing Radiation Protection Australian Radiation Laboratory Lower Plenty Road YALLAMBIE VIC 3085 AUSTRALIA Telephone: 61 3 433 2391 Fax: 61 3 432 1835
Japan Radiation Council	Dr. Toshiyuki Kumatori Chairman Japan Radiation Council c/o The Radiation Effects Association Maruishi Bldg. 5F 9-16, Kajicho-1 Chiyoda-Ku, Tokyo 101, JAPAN
National Radiological Protection Board	Dr. Michael O'Riordan Secretary National Radiological Protection Board Harwell Didcot Oxfordshire OX11 ORQ England United Kingdom
National Research Council, Canada	Dr. Art Marks, Chairman Advisory Committee on Radiological Protection c/o Mr. J.P. Goyette Atomic Energy Control Board P.O. Box 1046 Ottawa Ontario K1P 559 CANADA

Office of Science and Technology Policy	Dr. John Gibbons Director Office of Science and Technology Policy Old Executive Office Building Room 360 Washington, D.C. 20500 Telephone: 456-7116
Office of Science and Technology Policy (cont'd)	Mr. Jose Costa Acting Science Counselor Delegation of the Commission of the European Communities Suite 700 2100 M Street, N.W. Washington, D.C. 20037
Office of Technology Assessment	Ms. Hellen Gelband Project Director Health Program Office of Technology Assessment United States Congress 600 Pennsylvania Avenue, S.E. Washington, D.C. 20510 Telephone: 202-228-6590
South African Forum for Radiation Protection	J.K. Basson Chairman South African Forum for Radiation Protection PO Box 19070 Tygerberg 7505 Republic of South Africa
Ultrasonics Institute	Dr. G. Kossoff Director Commonwealth Scientific Instrumentation Research Organization Ultrasonics Institute 126 Greville Street Chatswood NSW 2067 Australia

United States Air Force	Major Don Jordan Office of the Surgeon General U.S. Air Force Headquarters 170 Luke Avenue, Ste 400 Bolling AFB Washington, D.C. 20332-6188
United States Nuclear Regulatory Commission	Mr. Stewart Schneider Chief Radiation Protection & Health Effects U.S. Nuclear Regulatory Commission Washington, D.C. 20555

RES GRANT PROPOSAL EVALUATION

GRANT TITLE: CRITICAL EVALUATION OF THE LINEAR - NO - THRESHOLD ASSUMPTION

GRANTEE: NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS

CRITERION EVALUATED: ADEQUACY OF THE RESEARCH DESIGN

A. Strengths: The proposer intends to convene a scientific committee of nationally recognized experts in the fields of radiation protection, epidemiology, cellular molecular effects, biophysics, genetics, DNA repair, experimental animal oncogenesis and dosimetry. In addition, the proposer would consult an additional 10 to 15 scientists with diverse backgrounds. These scientists would review all of the available literature, research developments, experimental data, and radiobiological theories. This approach should prove successful in critically evaluating the linear-no-threshold assumption of the response to radiation in humans.

B. Weaknesses: The proposer does not propose to provide information on appropriate next step in developing a more appropriate model for relating risk to radiation dose.

Radd 415-6215

Evaluator extension

*Last page provides overall summary

RES GRANT PROPOSAL EVALUATION

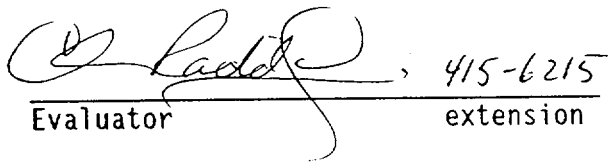
GRANT TITLE: CRITICAL EVALUATION OF THE LINEAR - NO - THRESHOLD ASSUMPTION

GRANTEE: NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS

CRITERION EVALUATED: SCIENTIFIC SIGNIFICANCE OF THE PROPOSAL

A. Strengths: The assumption of linearity plays a vital role in our system of radiation protection. Current dose limits are based primarily on risk estimates extrapolated from high dose, high dose rate studies of atomic bomb survivors. Dose to workers in the United States and to members of the public are generally at low doses and dose rates. A critical examination of the scientific support, or lack thereof, for the assumption that these risk estimates are true at low dose and low dose rates is warranted.

B. Weaknesses: The proposal does not include a plan for identifying approaches that might be feasible for reducing uncertainties in risk estimates.



Evaluator , 415-6215 extension

*Last page provides overall summary

RES GRANT PROPOSAL EVALUATION

GRANT TITLE: CRITICAL EVALUATION OF THE LINEAR - NO - THRESHOLD ASSUMPTION

GRANTEE: NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS

CRITERION EVALUATED: TECHNICAL ADEQUACY OF THE INVESTIGATORS AND THEIR INSTITUTIONAL BASE

A. Strengths: The NCRP is imminently qualified to perform this task. The principal investigator is a well respected national expert in the field of radiation. In addition, the NCRP has the responsibility to meet the objectives of this study as given in its charter. The NCRP is chartered by the U.S. Congress to collect, analyze, develop and disseminate recommendations about radiation protection. No other organization in the United States is so chartered.

B. Weaknesses: None.

Evaluator 415-6215 extension

*Last page provides overall summary

RES GRANT PROPOSAL EVALUATION

GRANT TITLE: CRITICAL EVALUATION OF THE LINEAR - NO - THRESHOLD ASSUMPTION

GRANTEE: NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS

CRITERION EVALUATED: RELEVANCE TO RESEARCH AREA DESCRIBED IN THE FEDERAL REGISTER NOTICE

A. Strengths: This proposal is not in response to a Federal Register Notice or Request for Proposal.

B. Weaknesses:

Evaluator 415-6215 extension

*Last page provides overall summary

RES GRANT PROPOSAL EVALUATION

GRANT TITLE: CRITICAL EVALUATION OF THE LINEAR - NO - THRESHOLD ASSUMPTION

GRANTEE: NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS

CRITERION EVALUATED: REASONABLENESS OF ESTIMATED COST IN RELATION TO THE WORK TO BE PERFORMED AND ANTICIPATED RESULTS

A. Strengths: The primary scientists performing tasks under this grant are volunteers. Funding is for travel for these volunteers and for consultants as needed. The cost is extremely reasonable considering the depth of expertise expected.

B. Weaknesses: None.

Evaluator 415-6215 extension

*Last page provides overall summary

RES GRANT PROPOSAL EVALUATION

GRANT TITLE: CRITICAL EVALUATION OF THE LINEAR - NO - THRESHOLD ASSUMPTION

GRANTEE: NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS

CRITERION EVALUATED: POTENTIAL BENEFIT OF THE PROJECT TO THE OVERALL BENEFIT OF THE INSTITUTION'S GRADUATE RESEARCH PROGRAM

A. Strengths: N/A

B. Weaknesses:

Evaluator 415-6215 extension

*Last page provides overall summary

RES GRANT PROPOSAL EVALUATION

Overall Summary and Comments

(X) Acceptable and should receive financial assistance. (Please comment as to reasons below. Additionally, comment on reasonableness of cost in relation to effort and expected results.)

( ) Proposal should be modified as described below.

( ) Not acceptable. Nature of work is not something for which NRC should provide financial assistance.

( ) Not acceptable. Work is not for a public purpose or is something NRC should acquire by contract.

( ) Not acceptable - for reasons other than above (describe below).

COMMENTS

This proposal provides a mechanism for an important first step in determining if the linear no threshold hypothesis is prudently conservative in its projection of risk from exposure to ionizing radiation. The cost of this examination of the paradigm under which all radiation protection decisions are currently made is very minor relative to its potential benefits to the government and to society as a whole.

Charleen T. Raddatz
Evaluator's Name


Evaluator's Signature

RES/DRA/RPHEB
Organization

415-6215 / T 9 C 28 / T 9 C 24
Extension/Room Number/Mail Stop

PROVISIONS FOR PLACING A GRANT WITH NCRP
ENTITLED, "CRITICAL EVALUATION OF THE LINEAR - NO THRESHOLD ASSUMPTION"

The following terms and conditions are incorporated into this grant:

1. NCRP will provide the NRC with a list of the committee members of Scientific Committee 1.6 within 30 days after the first meeting.

2. NCRP will provide quarterly progress reports with as much detail as possible. An outline of the Committee's final full voting report will be included in the third quarterly report.

3. The final product of this grant will be a full voting report and not a commentary.

Page 1 Cost Considerations Contract No. ~~NRC~~ NCRP RES-95-086 Mod No. _____
Task Order No. _____ Mod No. _____

	YES	NO WITH EXPLANATION BELOW	N/A
1. Are the labor categories proposed reasonable?	✓		
2. Are the personnel proposed qualified for their proposed labor categories?	✓		
3. Are the labor rates and hours proposed by labor category reasonable?	✓		
4. Is the total number of labor hours proposed reasonable?	✓		
5. Are the proposed amounts and prices for direct materials reasonable?			✓
6. Are the subcontract hours and rates proposed reasonable and necessary?			✓
7. Are the consultant hours and rates proposed reasonable and necessary?			✓

Page 2 Cost Considerations Contract No. NRC- NCRP RES-95-086 Mod No. _____
Task Order No. _____ Mod No. _____

	YES	NO WITH EXPLANATION BELOW	N/A
8. Is special testing and/or special equipment proposed necessary (contractor needs these items for the NRC contract and they are not generally applicable for the contractor's business) and are the amount and prices specified reasonable?			✓
9. Are the travel amounts prpoposed reasonable?	✓		
10. Are the other direct cost amounts necessary and reasonable in price and quantity?	✓		
11. Are the total proposed costs reasonable?	✓		
12. Is the technical proposal in exact accordance with the Statement of Work?			✓
13. Is the technical approach reasonable?	✓		

Page 3 Cost Considerations Contract No. NRC- NCRP RES-95-086 Mod No. _____
Task Order No. _____ Mod No. _____

	YES	NO WITH EXPLANATION BELOW	N/A
14. Is the performance schedule proposed reasonable?	✓		
15. Should the technical proposal be accepted as submitted? See Attachment 3.		✓	
16. Should the entire proposal be accepted as submitted? One year grant w/ one two-year option		✓	
17. Does the contract type proposed, i.e., cost, fixed-price, time and material, labor-hour, etc., appear reasonable?	✓		
18. Do any of the individuals proposed have, or appear to have any conflict of interest? Has any individual recently left employment with the NRC? If so, provide details. Use reverse, if needed.		✓	

August 21, 1995
Date

Marianne Reiss for Charlene Raddatz
Project Officer

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

August 22, 1995

RECOMMENDATION FROM RES FINANCIAL ASSISTANCE BOARD FOR SUPPORT OF THE GRANT PROPOSAL FROM THE NATIONAL COUNCIL ON RADIATION PROTECTION (NCRP) ENTITLED, "CRITICAL EVALUATION OF THE LINEAR - NO THRESHOLD ASSUMPTION" (RFAA RES-95-086, FIN G6590)

The RES Financial Assistance Board (FAB) has reviewed the subject grant proposal. The National Council on Radiation Protection (NCRP) is eligible for grant support in accordance with NRC Bulletin No. 5106-2. The technical reviewer and the FAB unanimously agree that the application meets all criteria for support.

NCRP has requested funds to convene a scientific committee of nationally recognized experts in the fields of radiation protection, epidemiology, cellular molecular effects, biophysics, genetics, DNA repair, experimental animal oncogenesis and dosimetry to review all of the available literature, research developments, experimental data, and radiobiological theories on the subject of the linear - no threshold assumption of the response to radiation in humans. This is an important first step in determining if the linear - no threshold hypothesis is prudently conservative in its projection of risk from exposure to ionizing radiation.

RES FAB recommends that the grant be approved for a total of $75,000 for the first year and will reconvene to consider a two-year extension of $75,000 per year when results of the first year's work are known.

Marianne Riggs, RES FAB Co-Chair

Lars Solander, OC, FAB Member

Shirley Crampton, DCPM FAB Member

Robin Teichman, OGC, FAB Member

RES Office Director's Decision

X Approved ____ Disapproved

David L. Morrison, Director
Office of Nuclear Regulatory Research