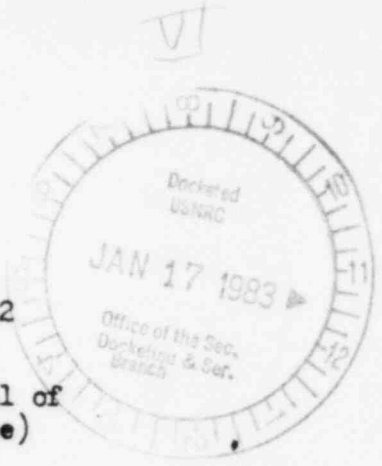
UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD



In the Matter of

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

(UCLA Research Reactor)

Docket No. 50-142

(Proposed Renewal of Facility License)

DECLARATION OF DR. IRVING LYON

I, Irving Lyon, do declare as follows:

1. I am a research biochemist and consultant in environmental health, with special experience in matters involving radiation from the nuclear fuel cycle and potential impacts upon human health. A statement of professional qualifications is attached.

2. I am a member of the Southern California Federation of Scientists, and serve on its Executive Board.

3. During 1979 I served as a consultant to the Committee to Bridge the Gap in an assessment of potential impacts of Argon-41 emissions from the UCLA reactor. I actively participated in the study, the results of which are reported in the CBG publication "The UCLA Nuclear Reactor: Is It Safe?" (October 3, 1979) and attest that, to the best of my knowledge and belief, the matters contained in that report are true and correct.

4. As indicated in that report, a review of the record regarding the Argon-41 emissions revealed that calibration errors, as well as failure to calibrate monitors at the required intervals, contributed to an underestimation of actual emissions by a factor of several hundred. This error apparently had existed without detection during the entire prior history of the reactor, some fifteen years. When corrected, the actual concentrations were found to be vastly in excess of the Maximum Permitted Concentrations, as found in 10 CFR 20 Appendix B, and UCLA was found to be in violation of both its license conditions and the regulations. Certain other violations were also cited, including loss of the maintenance log with the record for all prior maintenance, as well as calibration methods; failure to dilute the effluent

with 14,000 CFM of air, as required; exhaust stack height too short, putting it below both the level required by the license and below the level of the surrounding buildings; removal of an accelerator nozzle, further lowering the effective stack height; and so on. The failure to calibrate at the required intervals was also cited.

5. All of these violations were very significant from a public health and safety standpoint. They caused or contributed to the basic radiation protection regulations being violated for a period of fifteen years.

6. The response by UCLA to these cited violations was not corrective of the deficiencies. The NRC called an Enforcement Conference because of the asserted "unacceptable response" (unacceptable because UCLA said it would take much of a year before it could fix some of the problems, and the basic violation of MPC would not be resolved).

7. The final action taken amounted to a solution on paper without any change in the actual problem. UCLA proposed not to alter the stack height to the required level, but to alter the required level to the existing stack height; not to put the accelerator nozzle back on, but remove the requirement for the accelerator nozzle; and so on. Most worrisome from a public safety standpoint, rather than reduce the emissions concentrations, which is readily achievable (Argon-41 having a short half-life, 1.8 hours, decay tanks can be very effective; raised stack height can increase dispersion; moving the Math Sciences air inlet, which results in potential for significant exposures to significant numbers of people within, could mitigate their exposures), UCLA proposed to simply divide, <u>on paper</u>, the actual emissions concentration by a factor of 460. The response was most inappropriate, and did nothing to resolve the public health and safety problem.

8. Thus, the conditions first discovered in 1975 remain unchanged today.

9. In order to demonstrate that the reduction factor was appropriate, UCLA was required to undertake a TLD study. My review of that study indicates it does the opposite of demonstrate that the exception to the normal MPC restrictions was appropriate. The TLD results, even with the poor controls

(choosing background as the reading in Sunnyvale, hundreds of miles away and significantly higher than the TLD placed on Pauley Pavilion, at UCLA, a far more sensible control), indicate unacceptable doses in public areas, far in excess of any reasonable interpretation of ALARA.

10. The second effort to justify the pretense that the actual concentration was 1/460th of that measured was the so-called "Rubin thesis", a student project by one of the UCLA students associated with the reactor.

11. The stated purpose was to demonstrate that the reduction factor applied to the Argon emissions, particularly the component involving dispersion, was appropriately conservative, i.e. that concentrations higher than those estimated by use of the official NRC dispersion model could not reasonably be expected to be exceeded in unrestricted areas. (I understand that UCLA now attempts, as does the NRC Staff, to use the Rubin student project to support throwing out the conservative, official dispersion methodology employed in getting the original exception, using instead the Rubin results. This is a misuse of the Rubin thesis, which attempted to demonstrate that the NRC model was appropriately conservative, not to substitute his sketchy supposedly confirmatory data for the official model it was supposed to be confirming. Furthermore, it totally misunderstands the purpose of conservative safety analysis.)

12. The Rubin study is filled with flaws. This is to be expected, as it represents merely a student project, not a professional engineering or scientific controlled research study. The thesis cannot be relied upon to give accurate figures for maximum Argon-41 concentrations at various distances from the reactor stack. At best it can be used to give a first impression identification of which locations might be expected to produce the greatest risks to the public, but even that is uncertain, as the radiation exposure from the Argon is not a direct function of the immediate concentration, but of the geometrical configuration, since the Argon produces both long-travelling gamma and the shorter-travelling beta radiation. (For example, if Rubin estimated concentrations of x at waist level on the Math Sciences roof, concentrations many, many times

higher could readily occur just a few feet above the point where Rubin took his samples. Since gamma travels hundreds of feet in air, the concentration of gamma-emitting material immediately around an individual is not necessarily indicative of the actual dose received--it could be far higher than that estimated on the assumption of uniform concentration at the measured levels.)

13. The Rubin project did not have, by its own admission, the funds necessary to actually monitor for Argon concentrations. So it used a different substance altogether, SF_6, as a tracer, hoping that the two would behave identically. This was not demonstrated.

14. More importantly, Rubin did not have funds for continuous air-sampling devices, i.e., devices which continuously drew in samples of air over a period of time to integrate the data. Instead, he had some friends stand at different locations and once every half hour pull air into an ordinary syringe. They did this six times at just a few locations. Those six samples, as can be expected, produced extremely wide variations in readings, over several orders of magnitude, (e.g., 14-1417; a range of 7-1277 was found a mile away.) Thus, it would be quite incorrect to say that the Rubin thesis indicated a dispersion factor in a very narrow range. Quite the contrary. The data indicated ranges of several orders of magnitude.

15. Yet, despite these very wide variations, no error bars whatsoever are placed on the data, and Rubin committed the massive statistical error of taking the mean of the six readings. The six readings each, if relevant at all, represented the concentration at one of thousands of possible locations during a period of a few seconds out of an entire year. Yet these samples representing a few seconds were taken to be statistically significant, without error bars and with wide variation between them, and supposedly representative of conditions for an entire year. In other words, samples of a few seconds are assumed representative of a period of 32 million seconds (a year's worth). The variation between the samples demonstrates conclusively one could not use the mean for the six samples as statistically significant for a year.

Different locations, different atmospheric conditions, different momentary wind gusts all could produce very substantially higher concentrations. Rubin's student project was just that. It cannot be used to provide assurance regarding something as potentially significant to public health and safety as radioactive emissions.

16. Yet, even if one were to ignore all the flaws and accept Rubin's data as accurate--which, as indicated, I do not--the results are nonetheless very troubling, from an environmental and public health standpoint. Readings representing a very substantial fraction of the MPC, and thus, many times ALARA, are found in public places. The greatest potential exposure--many times what is reasonable under ALARA-- is found <u>within</u> the Math Sciences Building, because of the imprudent placement of the reactor stack directly upwind of the main air inlet for the building.

17. Thus, even were one to accept the validity of the Rubin student project measurements, it would indicate that the reactor was exposing large numbers of people (hundreds or thousands) to concentrations of radioactive Argon, a strong beta-gamma emitter, far in excess of amounts that could be considered ALARA. ALARA is generally taken to mean a very small fraction of background (on the order of 5%). The Rubin results, if accepted, would mean doses substantially larger. A research reactor, with a relatively small fission product inventory, fractional operation during the year, and placement on a college campus with a young, more radiosensitive population, including pregnant women, should certainly keep exposures to far less than, say, 5 mrem/yr. Far larger reactors can accomplish that. It is reasonably achievable for the far smaller UCLA reactor.

18. But the monitoring done to date at the facility is so poor, so badly controlled, and so contradictory, that one cannot know that the exposures are not far higher than the Rubin thesis would suggest. The TLD data suggest far higher doses. (The argument, incidentally, about the TLDs picking up radiation from the concrete is spurious; the lead brick readings indicate, if anything, that the concrete is less radioactive than normal terrestrial background. That TLDs go down when placed on brick is obvious; of course they do, since half of background is terrestrial and comes from below the TLD. Lead must block it out. But if lead only blocks out 20-30 mr/yr of reading, it is clear the concrete is not the source of the above-

background reading, because the dose would have to plummet 40-50 for background plus the amount above background the TLD had previously read. The TLD in the crack-in-the-concrete "trick" deserves almost no comment; of course putting a TLD in direct contact on several sides with concrete containing thorium, etc., will cause the TLD reading to be above background. But that says nothing about whether there is Argon-41 in significant concentrations on the roof of a building elsewhere on campus. Such games, instead of controlled, scientific measurements of the actual dose from the Argon-41, raise substantial questions about the seriousness of those entrusted with radiation protection at the UCLA reactor).

19. I understand that a portable survey instrument was used to attempt to measure, on a single day and at a single, unidentified location on the roof, the Argon contribution. While such attempts are to be encouraged, if there were a several order of magnitude difference in the result between the TLDs and the single reading at a single location on a single day, I would pick the TLDs. A fundamental principle of radiation counting statistics is that probability of error goes down as the number of samples and the counting time goes up. Thus, a score of TLD pairs, placed at a score or so of locations, changed quarterly for several years, all of which produce dose readings in the same range, would be far more reliable than a single shot reading with a portable survey instrument.

20. The most significant facts, in my opinion, are these: the concentration of Argon-41 at the only place it has been measured, where it enters the environment, is several hundred times MPC, the Maximum Permitted Concentration. Even when averaged over a year, taking into account down time for the reactor, it is still several dozen times MPC. The area in which it is emitted has no physical restrictions and is publicly accessible. The TLD readings indicate unacceptable doses. Argon-41 is readily controllable, through decay tanks and the like. Increased dispersion is readily achievable with simply obeying the basic premise of effluent emission that exhaust stacks be substantially above the nearby buildings. Exposure reduction to those in the Math Sciences Building is readily achievable by moving the air inlet for the building out of the reactor exhaust plume. The monitoring done at the facility has been totally inadequate to demonstrate safety; the measures necessary to protect the public and reduce exposure to as low as reasonably achievable have not been taken; the problems discovered years ago have not been corrected; public health and safety is at risk so long as these conditions continue.

I declare under penalty of perjury that the foregoing is true and correct to the best of my knowledge and belief.

Irving Lyon

Irving Lyon, PhD

Executed at Los Angeles, California, this 4th day of January, 1983

Statement of Professional Qualifications

DR. IRVING LYON

My name is Irving Lyon. I am a research biochemist and consultant in environmental health, with special experience in matters involving radiation from the nuclear fuel cycle and its effects on human health. I am also a member of the Southern California Federation of Scientists. In 1979 I served as a consultant to the Committee to Bridge the Gap and aided in the prepared of the report, "The UCLA Reactor: Is it Safe?" issued by CBG that year.

I received my A.B. degree in 1942 in Zoology and my M.A. in 1949 in Physiology from the University of California at Los Angeles. I received my Ph.D. in 1952 in Physiology from the University of California at Berkeley.

From 1952-54 I was a Rockefeller Foundation Fellow in the Medical Sciences at the Harvard School of Public Health. From 1954-58 I was a Research Biochemist, Physiology and Biochemistry of Skin, the Toni Co., Medical Dept., Chicago, Illinois.

From 1958-62 I held a Dual Appointment as Assistant Professor in the Department of Biological Chemistry of the University of Illinois College of Medicine, and as a Research Biochemist, Physiology and Biochemistry of Bone, in the Dept. of Orthopaedic Surgery, Presbyterian-St. Luke's Hospital, Chicago, Illinois.

From 1962-67 I was Assistant Professor and then Associate Professor, Dept. of Biochemistry, the Chicago Medical School, Chicago, Illinois.

From 1967-72 I was Professor of Biology, Science Faculty, Bennington College, Bennington, Vermont.

From 1972-74 I was Senior Visitor, Institute of Biological Chemistry, University of Copenhagen, Copenhagen, Denmark.

In 1975 I was Special Consultant to the California State Energy Commission, primarily dealing with environmental impact assessment of nuclear facilities and proposed facilities.

From 1975 to the present, I have been a Consultant on Environmental Health, with a special focus on environmental effects of nuclear fuel cycle components. I was principal researcher for two years for a study on radioactivity in California milk. For the last three years I have been engaged in biomedical research the the Veterans Administration.

In 1980 and again in 1981 I was a Visiting Lecturer at UCLA, teaching environmental effects of radiation from the nuclear fuel cycle.

I have more than 35 publications in biochemistry and biophysics in professional journals, and have written numerous reports for the State Energy Commission and others regarding draft environmental impact reports concerning nuclear power projects or other projects involving potential environmental impacts from radioactive materials.

THE UCLA NUCLEAR REACTOR

IS IT SAFE?

a preliminary report

Committee to Bridge the Gap
1637 Butler Avenue, Room 203
Los Angeles, CA 90025
(213) 478-0829

October 3, 1979

Summary

The following report represents the product of a four-month investigation into the safety of the UCLA nuclear reactor. Based extensively on documents obtained from the Nuclear Regulatory Commission and the reactor staff's own written reports, the Bridge the Gap study concludes that a history of noncompliance with regulations by the UCLA Nuclear Energy Laboratory (UCLA-NEL) -- and subsequent refusal by the NRC to enforce those regulations -- has permitted continued emissions of radioactive Argon gas into populated areas of campus in a manner that could readily pose a serious risk to the public. The study further urges a shutdown of the reactor until its safety can be conclusively demonstrated.

NRC inspection reports of the UCLA reactor for the last few years reveal the following:

** Radioactive emissions from the UCLA reactor were vastly underestimated for years.

** That actual emissions of radioactive Argon-41 at the reactor stack--the only place Argon has been directly measured--were fifty times the maximum concentration normally permitted by the NRC, even when the time the reactor isn't running is averaged in.

** That among the reasons UCLA did not know they were exceeding the Maximum Permissible Concentration of radioactive Argon was that they had not been calibrating the Argon monitor at the required interval and had lost the calibration method for that monitor along with the entire reactor maintenance log for all years prior to 1974.

** That the construction of the Math Sciences building, downwind from and taller than the reactor stack, could, in the words of an NRC inspector, "result in personnel being exposed to various concentrations of the gaseous effluent plume.' This was because "at one location readily accessible on the roof, it is possible to stand about 25 feet from the ventilation stack and look down upon the stack. Located on other portions of the roof are astronomical observatories, a meteorological laboratory, a seminar room and the upper portions of the math-science library."

** That the reactor stack was 17 feet shorter than required and that an "accelerator nozzle" specified in the Technical Specifications had been removed from the stack, further reducing its effective height.

A 1976 study undertaken by UCLA graduate student Mark Phillip Rubin in support of an amendment to the reactor's operating license (an amendment which the NRC granted permitting UCLA to continue releasing Argon concentrations at the stack in excess of the maximum normally permitted by the Code of Federal Regulations) states:

> Southwesterly winds blow the plume from the exhaust stack directly toward a ledge 30 feet away, which overlooks the stack, and then across the Math Science Complex roof. This roof contains many astronomy installations and is accessible to the general public. . . . From a radiological safety standpoint, it is unfortunate that the prevailing wind conditions are those that would cause the highest radiation exposures to the public.

Rubin concludes:

> The highest exposures to the public were discovered to be within the Math Science building. This occurs because a main ventilator intake for the building was found to be directly in the path of the reactor's exhaust plume.

Nonetheless, the NRC did not even consider the inside of the Math Science building in granting UCLA an exemption from normal restrictions on Argon-41 releases. In part, this was because they had never seen Rubin's thesis. When informed of the ventilation duct/Math Science problem and the Rubin study, the NRC radiation inspector for UCLA, R.D. Thomas, admitted he knew of neither. He also expressed surprise to learn that the roof area was not restricted to the public (there are 7 open doors and two elevators opening on the reactor complex roof.)

This study demonstrates that nearly every time the NRC expressed concern about a regulation violation or non-compliance with the reactor's Technical Specifications, the NRC changed the regulation or tech spec rather than require enforcement. In

short, the NRC's Inspection and Enforcement Division has neither adequately inspected nor enforced. The conditions uncovered by the NRC in 1974 and 1975 remain essentially unchanged today--there is still 50 times the normally permitted contration of Argon coming out of the reactor stack, the reactor stack is still below the level of surrounding buildings, the accelerator nozzle has once again been removed, and the roof remains widely used and openly accessible to the public. And further, the reactor continues to spew radioactive Argon into a main ventilator duct for the Math Science building.

"In 1974 the annual facility review by the Nuclear Regulatory Commission (NRC) showed that previous estimates of the amounts of activated argon gas (Argon 41) being released to the environment had been severely underestimated.

"Concerned with possible radiological exposures to the general populace in excess of that allowed in the Code of Federal Regulations (10-CFR-20), the Nuclear Regulatory Commission restricted the operating time on the UCLA reactor and ordered a review by the Nuclear Energy Laboratory (NEL) staff as to what steps must be taken to assure that the UCLA reactor was in compliance with federal regulations.

". . . The problem confronted by the NEL staff was to ensure to the satisfaction of the Nuclear Regulatory Commission that at no location beyond the controlled release point of the reactor stack, did Argon 41 concentrations exceed 4 x 10^{-8} uCi/ml, the limit set forth in 10-CFR-20.

". . . Southwesterly winds blow the plume from the exhaust stack directly towards a ledge 30 feet away, which overlooks the stack, and then across the Math Science Complex roof. This roof contains many astronomy installations and is accessible to the general public. This is the area which was identified as the location of potentially highest exposure. Additionally a southwesterly wind would blow the exhaust plume directly towards a major air conditioning inlet plenum for the building. This had been identified as another potential danger area. From a radiological safety standpoint, it is unfortunate that the prevailing wind conditions are those that would cause the highest radiation exposures to the public.

". . . The highest exposures to the public were discovered to be within the Math Science building. This occurs because a main ventilator intake for the building was found to be directly in the path of the reactor's exhaust plume."

from "Atmospheric Dispersion of Argon 41 from the UCLA Nuclear Reactor", a 1976 Masters Thesis by Mark Phillip Rubin, based on work "undertaken in support of an Amendment to the operating license for the UCLA nuclear reactor" that, when granted, exempted UCLA from the requirement to keep Argon emissions from the reactor stack to the Maximum Permissible Concentration defined in the Code of Federal Regulations.

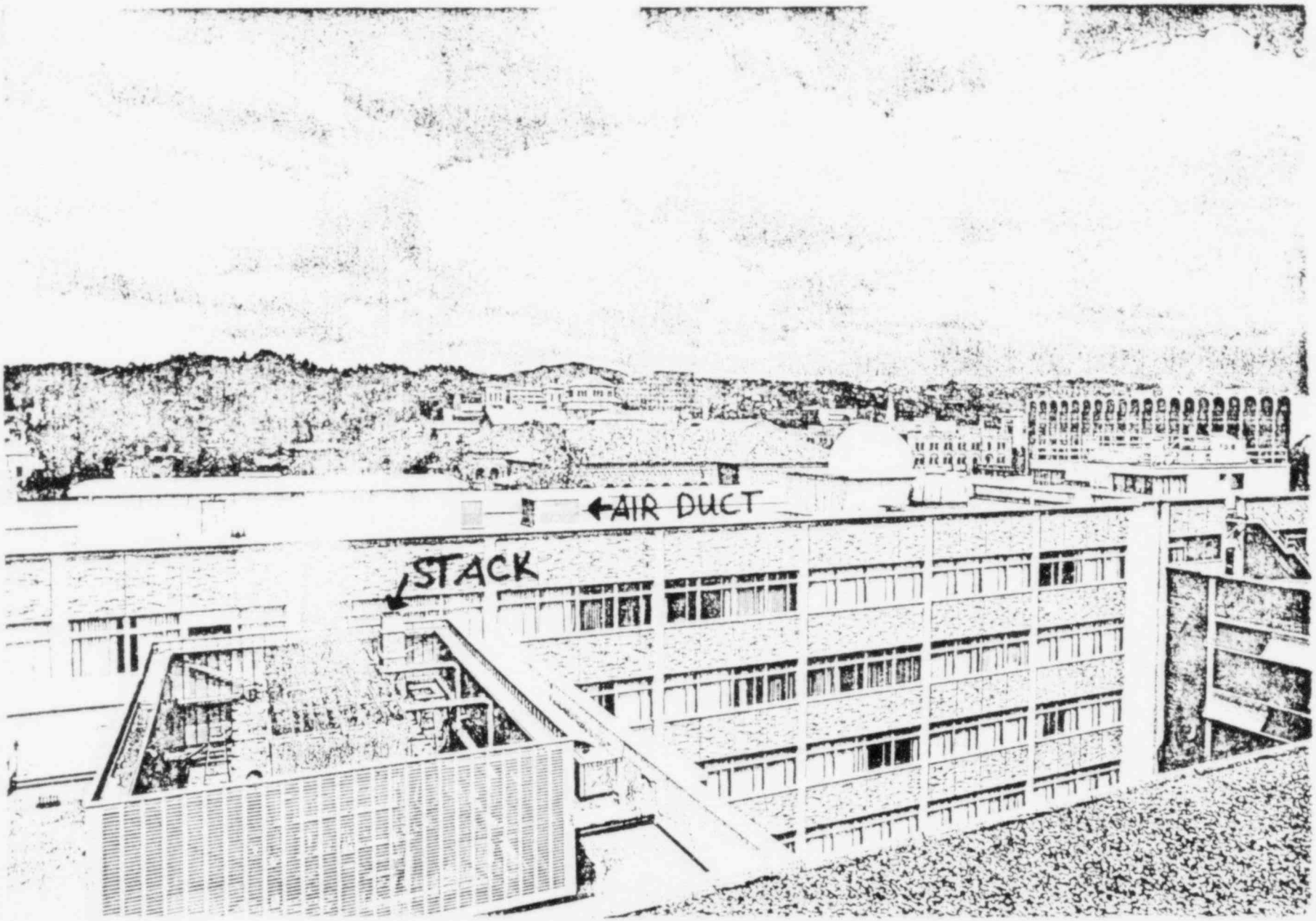
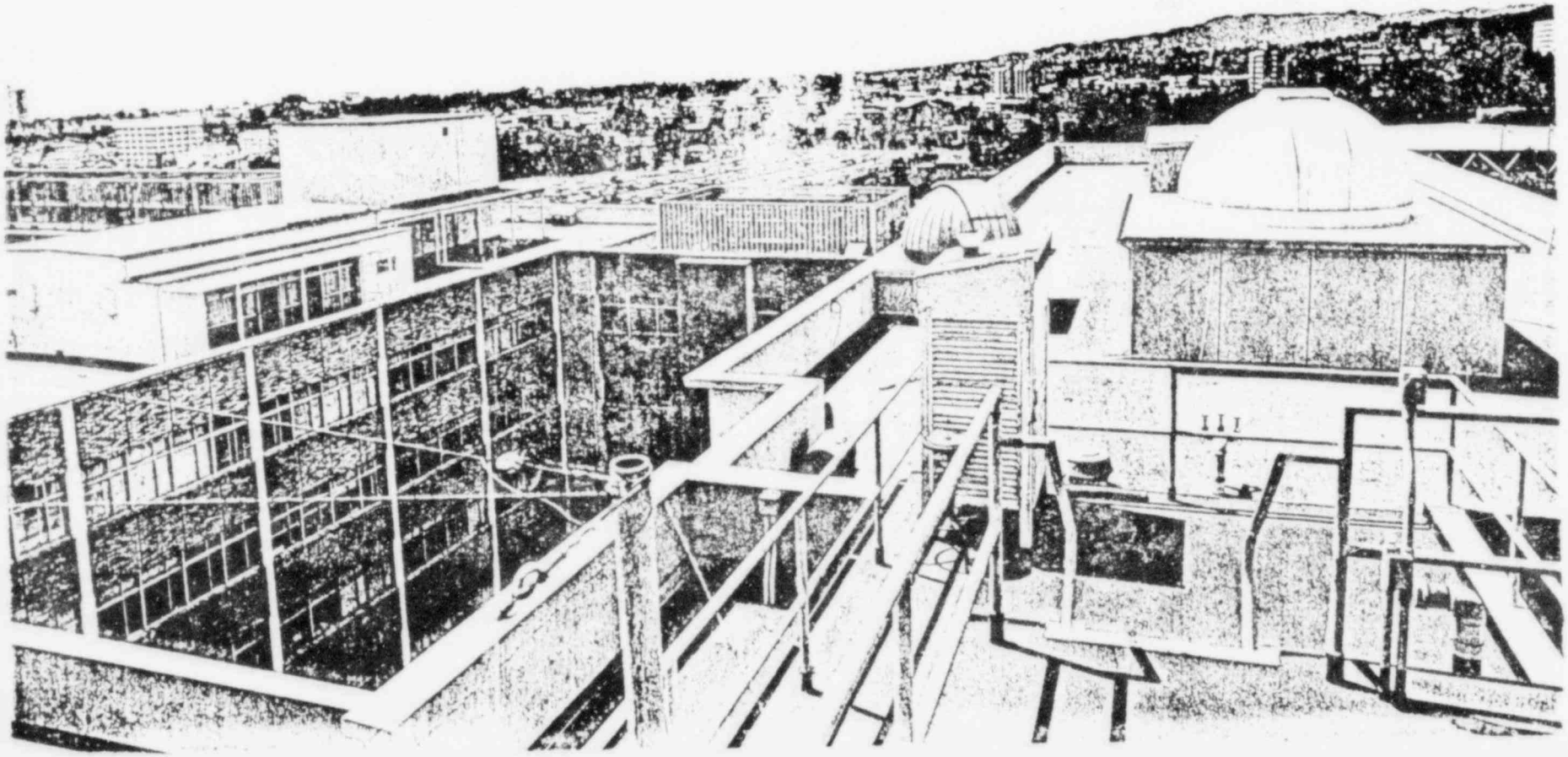


PHOTO FROM NRC FILES – LABELS ADDED

PREVAILING WINDS

Looking North from 10th level

Look west
from 10th 175' to stack



PREFACE

The research upon which the following report is based was conducted by the Campus Committee to Bridge the Gap, a non-profit educational organization based near UCLA.

Some polls have recently indicated that many people who support nuclear power at the same time don't want a nuclear facility in their neighborhood. Bridge the Gap's research, of which this report is but a first part, indicates that nuclear power <u>is</u> in our backyards, and that many of these little-known facilities have had a history of accidents, releases of radioactivity, and violations of safety regulations that would worry many of the staunchest defenders of nuclear development.

Dr. Irving Lyon, a consultant to our project and an expert on the effects of radiation, has often said that the medical principle of informed consent must be applied equally to the question of nuclear development. People have a right to not be exposed to radiation without their knowledge or consent. But, as we have documented in the report that follows, a significant risk to the public may well have existed at UCLA for years, without students and faculty being either informed or their consent given. The big question one gets from reading the hundreds of pages of NRC and other documents upon which this study is based is: Who is minding the store? Neither UCLA nor the Nuclear Regulatory Commission seem to have been overly concerned with safety regulations. When a regulation is violated, the response has been to amend rather than enforce the regulation, exempt from enforcement rather than protect.

We hope that our report, the first in a series on local potentially hazardous nuclear sites in Southern California, will be a small contribution to exposing a serious problem in a way which permits an informed public to choose whether to grant their consent to personal exposure to radiation from nuclear facilities.

ACKNOWLEDGMENTS

The research undertaken by Bridge the Gap that led to the report which follows was made possible by four months of long, hard work by a team of twenty volunteer researchers. Although their work continues on the next phases of the research into Southern California nuclear sites, some mention of them at this juncture would be appropriate.

Research Director for this project was D'On Voelzke. Research Assistants were Daniel Hirsch, Michael Rose and Michael Schwartz. Consultants were Dr. Sheldon Plotkin, safety engineer in private practice, formerly with RAND, TRW and Hughes; and Dr. Irving Lyon, an expert on the biological and environmental effects of radiation/radioactivity and formerly a Special Consultant to the California Energy Commission, a Professor at Bennington College, and a researcher at the Chicago Medical School. The list of others who assisted in the research and development of this report is too long to reprint here, but appreciation is conveyed to each and every person who put in the long hours that made this report possible. Particular appreciation is expressed to the many members of the Alliance for Survival chapter at UCLA who helped with the project.

Bridge the Gap was founded at UCLA in 1970 and has been active in social concerns ever since. Among its purposes are to communicate the concerns of the campus community to the outside community on important issues such as that of nuclear energy, and to educate the community about ways of "bridging the gap" between our present world and dwindling non-renewable energy sources (such as oil and uranium) and a needed future world based on safe, renewable resources. Bridge the Gap supports itself solely on individual donations. Comments on the report which follows, questions about other Bridge the Gap activities, or requests to be placed on our mailing list (free) can be addressed to :

CAMPUS COMMITTEE TO BRIDGE THE GAP
163[illegible] Butler Ave. Room 203
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CHRONOLOGY OF EVENTS REGARDING

ARGON-41 EMISSIONS FROM THE UCLA REACTOR

Construction of the UCLA Nuclear Energy Laboratory (UCLA-NEL) began in 1959, and operation began in 1960. During the early 1960's, concern was expressed in a series of correspondence between the Atomic Energy Commission and the UCLA Nuclear Energy Laboratory over methods of measuring Argon-41 emissions from the reactor.* This concern was increased over the years when it was discovered that a new building, Math Sciences, had been placed downwind of the reactor stack and that Argon emissions *"had been severely underestimated."* (A-1)

October 1974

On October 15, 1974, the Atomic Energy Commission notified UCLA that during an inspection on September 30 - October 2, 1974, *"It was found that certain of your activities appeared to be in violation of AEC requirements."* (D-1) The AEC demanded in writing within 20 days a statement outlining the corrective steps to be taken. They also expressed concern about *"your management control system that resulted in these violations."* (D-2) The violations were identified as:

> *1. Section VIII K.3 of the technical specifications require that a record be maintained of the principal maintenance activities and the reasons therefor. Contrary to this requirement, the record of maintenance activities prior to May 1974 was missing.*
>
> *2. Section II B.3 of the technical specifications requires that air drawn from the reactor room be exhausted to the atmosphere through an acceleration nozzle at 125 feet above ground level. Contrary to this requirement, no acceleration nozzle existed at the end of the stack.* (D-3)

As the inspection report #50-142/74-01 stated about the loss of the maintenance log: *"The loss of this log was of particular concern since records such as instrument calibrations were not otherwise available, and two key laboratory personnel with knowledge of previous maintenance had left UCLA employ."* (D-4) It should be noted that *"at the time of the inspection, the reactor was shut down for the repair of a water leak."* (D-4)

*Source: NRC Bibliography for UCLA-NEL Docket

Elsewhere in the same report, the inspector stated in reference to the acceleration nozzle, *"The licensee had no explanation for the absence of this device."* (D-2) He added that the stack was at least 8 feet shorter than required by the Technical Specifications.

At the same time that the NRC Inspection and Enforcement Office notified UCLA of the violations found in the last inspection, it sent a copy of that inspection report to NRC headquarters with a cover letter which stated:

> *The items of noncompliance appear to be oversights which indicate a need for more disciplined management. This conclusion is reinforced by previous experience with this licensee. Consequently, we intend to broaden the inspection effort at this facility until improved performance is evident."* (E-4)

NRC radiation specialist J.B. Baird informed Bridge the Gap that he thought this "broader effort" amounted to one radiation inspection a year, where previously they had been less frequent. He further said that he believed this policy to be still in effect.*

November 1974

In a response dated November 4, 1974, UCLA's Environmental Health and Safety Officer, Harold V. Brown, wrote, referring to the lost maintenance log: *"It appears that it will never reappear."* Brown also stated that an acceleration nozzle had been put on the reactor stack in response to the notice of violation (It has since been removed again--see photos in appendix.) There was no specific response regarding the question of stack height. (E-4)

January 1975

The first radiation safety inspection in the broadened program took place on January 23-24, 1975, by F.A. Wenslawski, an NRC Radiation Specialist. During this inspection, Wenslawski determined that:

1. The radiation monitors had not been calibrated as often as required.

2. Ventilation exhaust air from the reactor room was not being diluted to 14,000 cubic feet per minute and was not being released at 125 feet above ground level as required.

* In-person interview with J.B. Baird at the Bridge the Gap office on Sept. 27, 1979.

3. That although the corrective actions described in UCLA's November 4, 1974, letter had indeed been implemented, the ventilation exhaust system required additional modifications to meet the requirements of the Technical Specifications.

4. The method of radioactive particulate sample collection in the ventilation exhaust duct did not appear to assure the collection of a representative sample.

5. In what were described as *"other significant findings,"* the inspector reported that *"the licensee has tentatively found an error which would result in previously recorded and reported discharge concentrations and quantities being low by an approximate factor of ten."* (emphasis added.)

6. In an additional *"significant finding,"* the inspector stated in reference to the Math Science building, that *"extensive construction of new facilities around the reactor has resulted in a condition which could conceivably have personnel immersed in the discharge plume from the ventilation exhaust stack."*

(source: Inspection report 50-142/75-01)

Later on in the same inspection report, when the NEL representative was reminded that the dilution flow rate through the reactor stack was below the required level, and that the release height was only 108 feet rather than the 125 feet required, the *"licensee representative stated that to date no corrective action had been taken and that funding the modification is a problem. The licensee was unable to specify when the ventilation system would be modified to meet the technical specifications."* (G-3) As the NRC Radiation Specialist later stated, *"There exists a potential for personnel exposure to the gaseous effluent plume from the ventilation exhaust."* (H-1) He described this potential for exposure as *realistic."*

In a key passage of the January 1975 Inspection Report, NRC Radiation Specialist Wenslawski wrote:

> *While touring the roof of Boelter Hall-Math Science building complex, in which the reactor is located, the inspector noted that the discharge of the ventilation stack extends about 15 feet above the eighth floor roof. Other portions of the building complex extend to a partial ninth and tenth floor. At one location readily accessible on the roof, it is possible to stand about 25 feet from the ventilation stack and look down upon the stack. Located on other portions of the roof are astronomical observatories, a meteorological laboratory, a seminar room and the upper portions of the math-science library. With the exception of the library, access to these facilities is via the roof top.* (G-4) (emphasis added)

It is interesting to note that despite Wenslawski's report about ready public access to the roof, the NRC assigned a 10% occupancy factor to it, arguing that 90% of the working day no one is up there. NRC Inspector J.B. Baird later admitted that only

transit time was considered in making that estimate, not any time spent in the seminar room or laboratories or time spent eating lunch on the roof.

Wenslawski continued:

> *The inspector discussed with the licensee the possibility that the configuration of these facilities with respect to the ventilation stack could result in personnel being exposed to various concentrations of the gaseous effluent plume. The licensee agreed that exposures were conceivable and stated that they had once considered making portions of the roof a restricted area but rejected the concept because it was too impractical. The licensee recognized that increasing the height of the stack to the required elevation, 17 feet higher, and increasing the flowrate will likely alleviate the condition, but not necessarily eliminate it.* (G-4,5) *(emphasis added)*

And yet, the stack height remains today unchanged, and the flowrate is at correct levels only by virtue of having once again removed the accelerator nozzle from the top of the stack. This, despite the admission that public exposures to the radioactive plume were conceivable on a readily accessible roof near the stack. The passage went on:

> *Howbeit, it was the licensee's belief that due to rapid atmospheric dispersion and limited occupancy times an exposure in excess of 10 CFR 20 limits could not occur. Other than relatively insensitive radiation surveys (Paragraph 5.d), the licensee could not quantitatively demonstrate the actual radiological effects.* (G-5) *(emphasis added)*

Paragraph 5.d. referred to above stated, *"Other than a few contamination surveys outside the restricted area of the facility... the licensee essentially conducts no routine environmental surveillance."* Later, Wenslawski reports that UCLA considers one of their main sampling techniques *"to be somewhat crude and results are only intended to give a 'ballpark' estimate."* And in Paragraph 3.c. of the same report, Wenslawski questioned the representativeness of the sampling technique used by the reactor staff in monitoring for particulate contamination. Upon asking the reactor staff if they had used a particular Guide (ANSI N13.1-1969) in designing their monitoring system,

> *The licensee stated that he was unaware of the N13.1 standard and after a description of its content by the inspector, the licensee agreed to evaluate the particulate sampling system in light of the ANSI standard.* (G-7)

Actual Argon Emissions

The problem of ready public access to areas near the reactor stack was compounded by the discovery that *"previous estimates of the amounts of activated argon gas (Argon*

41) being released to the environment had been severely underestimated." This severe underestimation apparently had gone undetected for years. Several factors were involved in the error coming to light: 1) the loss of the maintenance log for years prior to 1974, 2) the failure of the reactor staff to calibrate the Argon monitor at required intervals (As Wenslawski wrote: *"The* [new] *maintenance log shows no record of this monitor being calibrated."* (G-5)), and 3) the inaccuracy of the Argon monitor itself (it was eventually replaced.)

The problem of calibration was severely complicated by the loss of the maintenance log. As Wenslawski wrote in this key inspection report:

> *When questioned about the validity of the calibration curve and the detector response to Ar-41 versus C-14, the licensee stated that the calibration curve was experimentally generated years ago and that documentation no longer exists which shows how the curve was developed or what error it may have. The licensee stated that a recent calculation performed to compare the expected response of Ar-41 to that of C-14 indicates that the existing calibration curve is in error by a factor of ten. The licensee representative further stated that he is convinced these calculations are correct."* (G-6,7) [emphasis added]

In the end, it was determined that while the calibration curve may have been off by a factor of ten, reported emissions had been off by a factor of about three hundred. For example, in 1971 the reactor reported Argon-41 releases of 0.3 Curies*: after detection of the monitoring error, the most recent report was 58 Curies for 1978, a year in which the reactor ran only about 2/3 as often. (Source: UCLA-NEL annual reports for 1971 and 1978). In UCLA's response to the NRC Notice of Violation following Wenslawski's inspection, the reactor Director, Thomas Hicks, said about the calibration method for the Argon monitor:

> *The history of the creation of the original scale factor has been lost, but arguments have been forwarded to the effect that the original scale factor included annual averaging and/or plume dissipation factors.* (J-5) [emphasis added]

During Wenslawski's January 1975 inspection he discussed with the reactor staff the interpretation of two parts of their Technical Specifications that seemed to him contradictory with respect to allowing averaging of radioactive discharges. His in-

* A Curie is a unit of radioactivity (3.7×10^{10} disintegrations per second): it is the amount of radioactivity associated with one gram of pure radium or its equivalent. One Curie is a sizeable amount of radioactivity; in laboratories, one handles even 1/1000th of a Curie with great care (e.g., in a lead box at some distance).

terpretation of Section VIII.M.1.b. was that it . . .

> *implies that averaging of discharge concentrations is not authorized. The licensee stated that they have always considered averaging to be authorized and stated that the normal full power discharge concentration . . . is well above the concentration limit of Appendix B, Table II, 10CFR20* [the applicable section of the Code of Federal Regulations] *and they would be unable to operate if they didn't average concentrations over a year.* (G-9) [*emphasis added*]

However, the inspector called his superiors and was told to permit averaging.(F-2)

The NRC inspector ended his January 1975 report with a section on what the NEL staff was and wasn't doing to meet the requirements written into their Technical Specifications that emissions of radioactivity be kept As Low As Practical (ALAP standards, now called ALARA standards for As Low As Reasonably Achievable). ALAP limits are generally 1/100th as high as the Maximum Permissible Concentration limits that had been concerning the NRC about the UCLA reactor. It is quite apparent that if there were enough concern to worry the NRC that the reactor was exceeding the MPC standards, it was almost certain that the ALARA standards, written into the NEL's Technical Specifications and one hundred times more stringent, were being violated. Although apparently not required to have ALARA standards written into their Technical Specifications, UCLA chose to, and it is our contention that they are thus bound by the ALARA standards in Nuclear Regulatory Guide 1.109 -- the only numerical ALARA standards. There is little doubt they are violating these standards. It is interesting to note further that huge nuclear power plants producing commercial electricity are required to show that they will be able to meet ALARA standards before they will even be granted a license. The UCLA reactor, far smaller, is apparently unable to meet the standards set for large commercial reactors!

Wenslawski wrote at the conclusion of his report, in a section marked ALAP:

> *The licensee was questioned with respect to action taken to meet Section V.D. of the Technical Specifications that release of radioactivity from the reactor facility shall be kept to as low a level as practical. The licensee stated that efforts in this behalf were primarily aimed at minimizing the possibility of generating Argon and attempting to preclude the release of Argon from the reactor.* (G-11) [*emphasis added*]

February and March, 1975

On February 21, 1975, the Nuclear Regulatory Commission sent to UCLA a Notice of Violation covering the concerns discovered by Wenslawski's inspection. (F-2) In a response from Lab Director Thomas Hicks, Hicks wrote that the NEL was requesting *"a complete improvement project from campus sources"* to triple the horsepower of one of the exhaust fans, add the necessary footage to the exhaust stack, and provide bracing for the stack. (I-2)

Despite UCLA's estimate that these improvements could be completed in six to nine months, the stack remains the same height and, indeed, the accelerator nozzle has once again been removed, reducing further the effective stack height. UCLA included in their response to the Notice of Violation a computer model by Applied Nucleonics entitled "Atmospheric Dispersion Analysis of Argon 41 Discharges from the UCLA Nuclear Reactor," (B) dated February 1975 (within weeks of Wenslawski's inspection). The report concluded that a modified stack would increase dispersion by more than four-fold (I-6), but the stack appears not to have been modified despite these conclusions and despite the pledge by Lab Director Hicks to the NRC in March of 1975 to modify the stack by, among other things, increasing its height. (I-2)

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UCLA's proposal to take six to nine months to increase the stack height and flow rate within the stack was deemed by the NRC to be an *"unacceptable response"* and an enforcement hearing was convened in Walnut Creek (NRC regional headquarters) on April 11, 1975 with representatives of the UCLA-NEL present. UCLA's response to the NRC Notice of Violation . . .

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The NRC took the short-term action action at the enforcement conference of restricting the operating hours of the UCLA reactor (to reduce Argon emissions by re-

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> *You will seek amendment to your Technical Specifications in the two areas involving noncompliance. This effort should proceed on a priority basis.*

Essentially, the NRC permitted UCLA to alter the rules to fit their operating bahavior rather than alter their operations to fit the rules. As the NRC put it:

> *As a permanent solution, the licensee would pursue with NRC Licensing a revised Technical Specification that would account for the higher level of radioactive gaseous discharges. Inherent in this action would be the need to resolve the discrepancy between the ventilation exhaust system design capabilities and Technical Specification requirements.* (K-1)

UCLA, in a letter dated April 15, 1975, agreed to keep the annual average Argon-41 releases from exceeding the Maximum Permissible Concentration of 4×10^{-8} uCi/ml in the short-run, and in the long-run to seek an amendment the primary purpose of which "*shall be to establish release limits in excess of 10 CFR 20 Appendix B, Table II. The amendment will be sought under the provisions of 10 CFR 20.106b.*" (J-2) *(emphasis added)*

This amendment to UCLA reactor's operating license (Amendment 10) was indeed requested under the provisions of the Code of Federal Regulations cited above. It permits a facility to be exempted from Maximum Permissible Concentration requirements at the release point (the stack) only if:

> *(1) The applicant has made a reasonable effort to minimize the radioactivity contained in effluents to unrestricted areas; and*
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> *(2) That it is not likely that radioactive material discharged in the effluent would result in the exposure of an individual to concentrations of radioactive material in air or water exceeding the limits in Appendix "B", Table II of this part.*

A review of the relevant UCLA and NRC documents suggests that UCLA made the bare minimum efforts to reduce the Argon emissions as required in point (1) above and made only ballpark estimates that are questionable at best in order to show compliance with item (2) of the federal regulation. The prime attempt by the NEL staff to reduce

the radioactivity in the effluent release was, by their own admission, *"over-ambitious and under-instrumented."* (T-35) It, not surprisingly, failed.

Commercial power plants use decay tanks to reduce their radioactivity emissions of short-lived radionuclides like Argon-41 (which has a half-life of 1.83 hours; it is generally considered to take ten half-lives before a radionuclide has decayed completely). The principle is simple: isolate the radioactive substance long enough so that it can decay away before being released to the atmosphere. There are problems with decay tanks, primarily the possibility of exposure to nuclear facility workers and the possibility of an accidental release of the material stored in the tank before it has had a chance to decay. But decay tanks are used as a major way of dealing with the kind of problem posed by the Argon-41 at UCLA.

Thus, it is interesting to note that during a 1979 inspection the NEL staff told the NRC inspector that *"a change to Section V.E. of the Technical Specifications was being considered due to a projected increase in the reactor use factor . . . If it is determined that the increased use factor will produce an unacceptable increase of Argon-41 concentrations, the licensee proposed to use a compressor and decay tank system to collect the Argon-41 for storage and release after a decay period."* ()-6) And in a 1976 report by the NEL (C-35) we find another anticipated reactor change that would increase Argon levels:

> *In order to attract more business and to eliminate our reactor users' shopping elsewhere for a higher neutron flux, the reactor may be slightly altered to go to higher power levels, i.e., 500 kW or 1 MW. The current licensed power level is only 100 kW.*

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their present license expires in March 1979--and then request increased operating time and perhaps increased power.)

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The Rubin Thesis

In support of the requested amendment to the NEL operating license, a graduate student, Mark Phillip Rubin, undertook a study using sulfur hexafluoride (SF_6) as a tracer to estimate air dispersion factors and thus estimate argon concentrations at various sites around the reactor stack. Rubin indicated in his master's thesis, which reported on the results of his study, that instruments that could measure the actual argon concentrations at locations beyond the stack were not available at UCLA and that money was not available for purchasing or fabricating them. So, by using another substance, SF_6, that he could measure, Rubin hoped to be able to simulate Argon dispersion. As shown in the passage quoted at the beginning of this report, and in the two plume diagrams contained in the Appendix, Rubin found that the pre-

vailing winds create two areas of greatest public exposure--the roof of Math Sciences, with the astronomy and meteorological installations and ready public access, and the inside of Main Sciences, because a main ventilator intake for the building was found in the path of the exhaust plume. The highest exposure figures Rubin found were inside the building. However, by averaging operating time and, for the roof, also using a 10% occupancy factor, Rubin was able to argue that the MPC was not likely to be exceeded in any populated area.

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And, at one point in the thesis Rubin indicates *"that the current NRC model for atmospheric dispersion . . . predicted levels of Argon which were 15 to 105 times*

higher than the experimentally determined values." (A-31) Yet, it was on the basis of the NRC dispersion model that UCLA was granted an exemption from the MPC-at-the-stack limitations and permitted them to continue giving out Argon there in concentrations way in excess of normal limits. If the NRC model predicted levels 15-105 times higher than Rubin found, and since Rubin found levels inside Math Sciences (averaged over the year) that were 12% of the MPC, then it would seem reasonable that the NRC model's predicted values for inside the Math Science building would be considerably in excess of the Maximum Permissible Concentration and the Amendment should not have been granted, if it was on the basis of the NRC model that the amendment was granted.

But the NRC did not take into consideration the inside of the Math Science building in granting the Amendment! This was confirmed to us by J.B. Baird, NRC Radiation Specialist. It was not considered apparently because the NRC did not know about the problem with the air-conditioning duct. The amendment was granted without considering the area Rubin concluded was that of highest likely exposure--the inside of the Math Science building! And the NRC's own model would apparently predict levels therein in excess of the maximum permissible. Yet UCLA was granted an exemption from the normal requirements and has continued to give out Argon-41 in about the same concentration it has for the last decade or two.

The TLD Program

The Amendment was granted on the condition that a thermo-luminescent dosimetry program be established to measure, not Argon, but general radioactivity. TLD's--a kind of film that shows radiation exposure--have a reputation for considerable inaccuracy. The kind UCLA used, Ca-Dy sulfate, particularly so. While we have not yet completed our analysis of the TLD study done by the NEL staff--we have as yet to receive the raw data upon which the summary results we have were based--the following facts raise questions about the validity of the TLD study:

1. Of the twenty or twenty-two dosimeters placed (the reports differ as to the total), the results from about half were considered by the NEL staff as "anomolously high" and thus dismissed, arguing they were picking up radiation from the concrete on which they were placed. (X-20,24)

2. Their TLD study indicated that a few dosimeters *"were lost to birds and possibly to curious individuals."* (X-20) Thus, the sample size was further reduced.

3. In the end, of the twenty originally placed dosimeters, about one third were used in the final calculations. The study added, however, that *"even if the readings of concrete-mounted dosimeters are rejected, the remaining data are not free of ambiguous interpretation."* (X-24)

4. It should be noted that even if the concrete-mounted dosimeters were left in the sample, the levels reported are still relatively low. But, surprisingly, virtually the same low reading is reported by the TLD on the reactor stack, where we know the Argon concentration is considerably in excess of the MPC. (NEL reported concentration at full power is 1×10^{-5} uCi/ml and the MPC is 4×10^{-8} uCi/ml, 250 times higher. Even averaging in operating time the concentration at the stack is still well over the MPC level.) The reading from the TLD on the reactor stack is about the same as that reported by the TLD's 100 feet away, where the dispersion factor is given by Rubin to be about 250, more according to the official model. The concentration should thus be much less on the roof than on the stack, the NEL argues; but the TLD figures at both places are quite close. Even with differences in plume configuration out of the stack and on the Math Sciences roof, it seems clear that one or both TLD's are not giving accurate readings, calling into question the entire program.

5. 5 of the 7 TLD's whose readings were not dismissed were used to give radiation estimates for both regions of the roof--the area near the reactor stack (considered a restricted area by UCLA and the NRC*) and the clearly unrestricted areas on the rest of the roof.

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* UCLA was granted the Amendment in part by declaring the area directly around the reactor stack a "restricted area", defined in the Code of Federal Regulations Part 20.3.a.14 as *"any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials."* The NEL had to make no changes to the reactor stack area to have it considered restricted by the NRC; a four-foot wall with a stepladder next to it is all that separates it from the unrestricted area. It isn't even posted.

The Present

On August 21, 1979, two Bridge the Gap members met in the Walnut Creek headquarters of the NRC with R.D. Thomas, the NRC radiation safety inspector for UCLA. They discovered at that time that Mr. Thomas did not know about the Rubin study, nor about the air-conditioning duct and the possible expcsure inside the Math Sciences building, and thought that the entire roof area was restricted with locked doors. We informed him of these matters at that time and urged him to look into them.

On September 10, 1979, Bridge the Gap sent a formal statement of concern about the UCLA reactor, enclosed the Rubin thesis which the NRC had not previously seen, and urged that the NRC undertake a surprise inspection of the UCLA reactor to investigate the issues that had been raised. About three weeks later, and following repeated inquiries to the NRC by reporters looking into the issue, Bridge the Gap received a visit from J.B. Baird, another NRC Radiation Specialist. He had been sent down to UCLA to do an inspection--and apparently to convince us everything was OK at the reactor. He had never been to the UCLA reactor before, had read only a small fraction of the NRC docket on UCLA related to the Argon problem, and spent only a few hours at the reactor during his inspection, but reported that he found no evidence of violations of regulations. He did say that the NRC might look into the question of exposure within the Math Science building.

That is not enough, in our view, to protect public safety when a serious question has been raised about possible hazards. So Bridge the Gap has requested the NRC to hold public hearings into the relicensing of the UCLA reactor--whose license expires in March of 1979--and to grant us formal intervenor status in those procedings to present the information we have uncovered. And we urge that the reactor be shut down until its safety can be conclusively demonstrated.

FOOTNOTES/BIBLIOGRAPHY

Key: The footnote system used in the text of the report identifies the document by letter and the page by number. For example, "F-6" would refer to page 6 of bibliography item F, below.

A. "Atmospheric Dispersion of Argon 41 from the UCLA Nuclear Reactor," a master's thesis by Mark Phillip Rubin, 1976

B. "Atmospheric Dispersion Analysis of Argon-41 Discharges from the UCLA-NEL Nuclear Reactor" prepared for UCLA-NEL by Applied Nucleonics Company, February 1975

C. "Annual Report, Nuclear Energy Laboratory, January 1, 1976 to December 31, 1976," by Ivan Catton, Director

D. RO Inspection Report No. 50-142/74-01, including NRC Notice of Violation to UCLA dated October 15, 1974.

E. Four items related to UCLA Violations forwarded to AEC Public Document Room by R.H. Engelken, AEC Region V, on November 11, 1974.

F.1. Correspondence to H.D. Thornburg, Inspection and Enforcement Headquarters, NRC, by HE. Book, Chief of Radiological And Environmental Protection Branch, NRC Region V. Also memo to UCLA by F.A. Wenslawski, Radiation Specialist for the NRC, dated February 21, 1975.

F.2. NRC Notice of Violation to UCLA dated February 21, 1975.

G. Inspection Report No. 050-142/75-01

H. "Estimated Doses from Argon-41 Releases, UCLA," by NRC Radiation Specialist Wenslawski, dated February 21, 1975.

I. UCLA response to NRC Notice of Violation, dated March 13, 1975.

J. Letter to NRC, Region V, by Thomas Hicks, NEL Director, summarizing commitments made by UCLA at enforcement conference in Walnut Creek.

K. "NRC Memo :Enforcement Conference and Subsequent Actions, UCLA, Docket No. 50-142" April 22, 1975, including NRC photos of reactor roof.

M. Inspection Report No. 50-142/76-02

N. NRC Inspection Report No. 50-142/78-02

O. NRC Inspection Report No. 50-142/79-01

P. UCLA Nuclear Reactor Annual Report 1971

Q. Annual Report 1972

R. Annual Report 1973

S. Annual Report 1974

T. Annual Report 1975

U. Annual Report 1976

V. 1976 Annual Report: Appendix

W. Annual Report 1977, UCLA-NEL

X. Annual Report 1978, UCLA-NEL

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We find many problems with the study. Only three days of tests were conducted, and each test only three hours in duration. Only three locations inside the building were tested, each only once, one on one day and two on another. Vast variation in readings were found in the samples taken every half hour (air pulled quickly into a syringe)--variation of up to 600:1 in the six samples taken over a three hour period, explained by Rubin as being due to air shifting when the wind gusts. He admitted that a device which slowly pulls air into the syringe over a half-hour period would have resolved that problem, but didn't use such equipment. Studies suggesting that heavy molecules like SF_6 behave over short distances similarly to lighter molecules like Ar41 are mentioned, but there is no citation for that. No probability of error is given for his concluding statistics--no doubt because six samples in one location over three hours would not be considered a large enough sample to be given any statistical significance in making a judgment about yearly average concentrations. One relatively high reading (given the distance) was reported on Hilgard Avenue, yet we find that Hilgard was also given a 10% occupancy factor (this despite the fact that people reside in homes on Hilgard!) The 10% occupancy factor for the roof area in the Math-Science Boelter complex seems particularly suspect, given the 9 open entrances and many public facilities on those roofs described previously. (There is apparently so much use of the roof area that there is a restroom up there.)

And, at one point in the thesis Rubin indicates *"that the current NRC model for atmospheric dispersion . . . predicted levels of Argon which were 15 to 105 times*

higher than the experimentally determined values." (A-31) Yet, it was on the basis of the NRC dispersion model that UCLA was granted an exemption from the MPC-at-the-stack limitations and permitted them to continue giving out Argon there in concentrations way in excess of normal limits. If the NRC model predicted levels 15-105 times higher than Rubin found, and since Rubin found levels inside Math Sciences (averaged over the year) that were 12% of the MPC, then it would seem reasonable that the NRC model's predicted values for inside the Math Science building would be considerably in excess of the Maximum Permissible Concentration and the Amendment should not have been granted, if it was on the basis of the NRC model that the amendment was granted.

But the NRC did not take into consideration the inside of the Math Science building in granting the Amendment! This was confirmed to us by J.B. Baird, NRC Radiation Specialist. It was not considered apparently because the NRC did not know about the problem with the air-conditioning duct. The amendment was granted without considering the area Rubin concluded was that of highest likely exposure--the inside of the Math Science building! And the NRC's own model would apparently predict levels therein in excess of the maximum permissible. Yet UCLA was granted an exemption from the normal requirements and has continued to give out Argon-41 in about the same concentration it has for the last decade or two.

The TLD Program

The Amendment was granted on the condition that a thermo-luminescent dosimetry program be established to measure, not Argon, but general radioactivity. TLD's--a kind of film that shows radiation exposure--have a reputation for considerable inaccuracy. The kind UCLA used, Ca-Dy sulfate, particularly so. While we have not yet completed our analysis of the TLD study done by the NEL staff--we have as yet to receive the raw data upon which the summary results we have were based--the following facts raise questions about the validity of the TLD study:

1. Of the twenty or twenty-two dosimeters placed (the reports differ as to the total), the results from about half were considered by the NEL staff as "anomolously high" and thus dismissed, arguing they were picking up radiation from the concrete on which they were placed. (X-20,24)

2. Their TLD study indicated that a few dosimeters *"were lost to birds and possibly to curious individuals."* (X-20) Thus, the sample size was further reduced.

3. In the end, of the twenty originally placed dosimeters, about one third were used in the final calculations. The study added, however, that *"even if the readings of concrete-mounted dosimeters are rejected, the remaining data are not free of ambiguous interpretation."* (X-24)

4. It should be noted that even if the concrete-mounted dosimeters were left in the sample, the levels reported are still relatively low. But, surprisingly, virtually the same low reading is reported by the TLD on the reactor stack, where we know the Argon concentration is considerably in excess of the MPC. (NEL reported concentration at full power is 1×10^{-5} uCi/ml and the MPC is 4×10^{-8} uCi/ml, 250 times higher. Even averaging in operating time the concentration at the stack is still well over the MPC level.) The reading from the TLD on the reactor stack is about the same as that reported by the TLD's 100 feet away, where the dispersion factor is given by Rubin to be about 250, more according to the official model. The concentration should thus be much less on the roof than on the stack, the NEL argues; but the TLD figures at both places are quite close. Even with differences in plume configuration out of the stack and on the Math Sciences roof, it seems clear that one or both TLD's are not giving accurate readings, calling into question the entire program.

5. 5 of the 7 TLD's whose readings were not dismissed were used to give radiation estimates for <u>both</u> regions of the roof--the area near the reactor stack (considered a restricted area by UCLA and the NRC*) and the clearly unrestricted areas on the rest of the roof.

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* UCLA was granted the Amendment in part by declaring the area directly around the reactor stack a "restricted area", defined in the Code of Federal Regulations Part 20.3.a.14 as *"any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials."* The NEL had to make no changes to the reactor stack area to have it considered restricted by the NRC; a four-foot wall with a stepladder next to it is all that separates it from the unrestricted area. It isn't even posted.

The Present

On August 21, 1979, two Bridge the Gap members met in the Walnut Creek headquarters of the NRC with R.D. Thomas, the NRC radiation safety inspector for UCLA. They discovered at that time that Mr. Thomas did not know about the Rubin study, nor about the air-conditioning duct and the possible exposure inside the Math Sciences building, and thought that the entire roof area was restricted with locked doors. We informed him of these matters at that time and urged him to look into them.

On September 10, 1979, Bridge the Gap sent a formal statement of concern about the UCLA reactor, enclosed the Rubin thesis which the NRC had not previously seen, and urged that the NRC undertake a surprise inspection of the UCLA reactor to investigate the issues that had been raised. About three weeks later, and following repeated inquiries to the NRC by reporters looking into the issue, Bridge the Gap received a visit from J.B. Baird, another NRC Radiation Specialist. He had been sent down to UCLA to do an inspection--and apparently to convince us everything was OK at the reactor. He had never been to the UCLA reactor before, had read only a small fraction of the NRC docket on UCLA related to the Argon problem, and spent only a few hours at the reactor during his inspection, but reported that he found no evidence of violations of regulations. He did say that the NRC might look into the question of exposure within the Math Science building.

That is not enough, in our view, to protect public safety when a serious question has been raised about possible hazards. So Bridge the Gap has requested the NRC to hold public hearings into the relicensing of the UCLA reactor--whose license expires in March of 1979--and to grant us formal intervenor status in those procedings to present the information we have uncovered. And we urge that the reactor be shut down until its safety can be conclusively demonstrated.

FOOTNOTES/BIBLIOGRAPHY

Key: The footnote system used in the text of the report identifies the document by letter and the page by number. For example, "F-6" would refer to page 6 of bibliography item F, below.

A. "Atmospheric Dispersion of Argon 41 from the UCLA Nuclear Reactor," a master's thesis by Mark Phillip Rubin, 1976

B."Atmospheric Dispersion Analysis of Argon-41 Discharges from the UCLA-NEL Nuclear Reactor" prepared for UCLA-NEL by Applied Nucleonics Company, February 1975

C."Annual Report, Nuclear Energy Laboratory, January 1, 1976 to December 31, 1976,"by Ivan Catton, Director

D. RO Inspection Report No. 50-142/74-01, including NRC Notice of Violation to UCLA dated October 15, 1974.

E. Four items related to UCLA Violations forwarded to AEC Public Document Room by R.H. Engelken, AEC Region V, on November 11, 1974.

F.1. Correspondence to H.D. Thornburg, Inspection and Enforcement Headquarters, NRC, by HE. Book, Chief of Radiological And Environmental Protection Branch, NRC Region V. Also memo to UCLA by F.A. Wenslawski, Radiation Specialist for the NRC, dated February 21, 1975.

F.2. NRC Notice of Violation to UCLA dated February 21, 1975.

G. Inspection Report No. 050-142/75-01

H. "Estimated Doses from Argon-41 Releases, UCLA,"by NRC Radiation Specialist Wenslawski, dated February 21, 1975.

I. UCIA response to NRC Notice of Violation, dated March 13, 1975.

J. Letter to NRC, Region V, by Thomas Hicks, NEL Director, summarizing commitments made by UCLA at enforcement conference in Walnut Creek.

K."NRC Memo :Enforcement Conference and Subsequent Actions, UCLA, Docket No. 50-142" April 22, 1975, including NRC photos of reactor roof.

M. Inspection Report No. 50-142/76-02

N. NRC Inspection Report No. 50-142/78-02

O. NRC Inspection Report No. 50-142/79-01

P. UCLA Nuclear Reactor Annual Report 1971

Q. Annual Report 1972

R. Annual Report 1973

S. Annual Report 1974

T. Annual Report 1975

U. Annual Report 1976

V. 1976 Annual Report: Appendix

W. Annual Report 1977, UCLA-NEL

X. Annual Report 1978, UCLA-NEL

Note: We've moved again! Please note new address:

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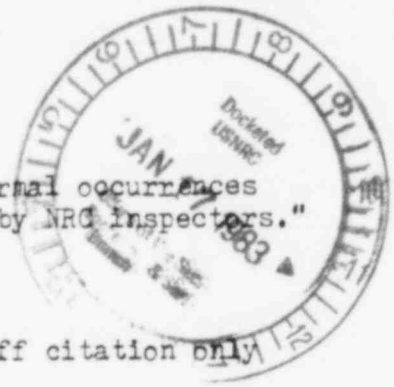
CONTENTION VII



RESPONSE TO STAFF'S ASSERTED MATERIAL FACTS

1. "The causes and corrections of all events termed abnormal occurrences and unscheduled shutdowns at UCLA have been investigated by NRC inspectors."

DISPUTED

(Plotkin declaration for VII, P 5; note also that the Staff citation only refers to the period 1976-80)

2. "Unscheduled shutdowns are common at research reactors used in student training."

DISPUTED, although noted that the statement is really TOO VAGUE TO RESPOND TO. (How frequent is "common." Is it being asserted that the frequency of unscheduled shutdowns at UCLA is no more frequent than at other research reactors?)

(September 9, 1981, letter, NRC's J.M. Felton to CBG's Mark Pollock, "Due to the variance in design of nonpower reactors, the NRC does not have comparative statistical data, at present, which would evaluate the performance of different research reactors as to unintentional scrams, abnormal occurrences and violations."; also, Johnson, P3, Morrill, P5-7--neither of Staff's citations mentions the fact attributed to them.)

3. "No accidents have occurred at the UCLA reactor causing damage to property or harm to persons."

DISPUTED

(Plotkin declaration as to VII, P9; Plotkin declaration as to III, Piv, 5,9; Monosson declaration as to IV, P2-3,10-11,14-21; Hirsch declaration as to X, P.4-5 and attachment)

4. "No events posing a threat to public health and safety have occurred at the UCLA research reactor during its twenty years of licensed operation."

DISPUTED

(Plotkin declaration as to VII, P5-10; Plotkin as to III, P iv, 1-39; Monosson declaration as to IV, entire; Hirsch as to X, P4-5; Foster, P 3-26; Lyon, P4-7,20; Cooperman, P3-5, Docket 50-142)

5. "Reliability of reactor operation is not part of the Commission's regulatory responsibility absent a safety consideration."

LEGAL CONCLUSION

RESPONSE TO UCLA'S ASSERTED FACTS

30. "The UCLA reactor facility has experienced no accidents which have harmed any member of the public."

DISPUTED

(same citations as to Staff "fact" 3 above)

31. "None of the unscheduled shutdowns or abnormal occurrences which have occurred at the UCLA reactor facility are of safety significance."

DISPUTED

(Plotkin declaration as to VII, P5-10; Norton as to V, P69)