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	)	Docket No. 50-142 (Proposed Renewal of Facility License)
	)	
(UCLA Research Reactor)	)	

COMMITTEE TO BRIDGE THE GAP'S SUPPLEMENTAL CONTENTIONS TO PETITION FOR LEAVE TO INTERVENE

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President: Campus Committee
To Bridge The Gap

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INTRODUCTION

On April 25, 1980 a notice was published by the Commission offering a hearing on the renewal of the operating license held by the Regents of the University of California (Applicant) for the UCLA Research Reactor. On May 22, 1980 the Committee to Bridge the Gap (Petitioner) filed a petition for Leave to Intervene. On July 22, 1980 the Atomic Safety and Licensing Board scheduled a pre-hearing conference for September 18, 1980, which was subsequently rescheduled for September 25, 1980. In its order scheduling the pre-hearing conference the Board invited Petitioner to submit supplemental contentions to its original petition for Leave to Intervene. These supplemental contentions are hereby being submitted by Petitioner in response to the Board's invitation and in conformance with the requirements of 10 CFR 2.714(b).

10 CFR 2.714(b) allows an intervention Petitioner to supplement his petition with the "contentions which petitioner seeks to have litigated in the matter, and the bases for each contention set forth with reasonable specificity " prior to the Special Pre-hearing Conference. At the Conference the Board is to determine whether petitioner's contentions meet the requirements of 10 CFR 2.714(b), and thereby determine the scope of discovery.

These supplemental contentions submitted by Petitioner hereby incoporate by reference, and are supplemental to, although not limited by, the petition for Leave to Intervene. The supplemental contentions cover a broad range of issues and problems, reflecting the wide variety of deficiencies in the reactor operation and the fact that the license request may be judged against a twenty year operating history. The supplemental contentions will focus on three major areas of argument: 1. That the application filed by UCLA is incomplete, misleading, contains material errors of fact, and is generally inadequate to support the issuance of the requested license; 2. That the history of deficiencies in the reactor operation over the previous twenty years makes it impossible for the Applicant to reasonably assure that, in the future, they will comply with the regulations applicable to them, and that they will not endanger the public health and safety; 3. That inherent problems of the reactor, such as, age, seismic vulnerability, location in a densely populated area, etc., indicate that the reactor cannot be operated in a manner that will not be inimical to the public health and safety.

Each contention set forth below must be considered in the context of the fact that Petitioner has had no opportunity for discovery and has had no access to a public reading room, and is merely setting forth the areas of contention to be litigated in the licensing process. The burden in this licensing process, under the provisions of 10 CFR 2.732, is on the Applicant. They must meet the common standard set forth in 10 CFR 50.40(a) and in 10 CFR 50.57(3) that the whole effect of the license application and the past operation is to "collectively provide reasonable assurance that the applicant will comply with the regulations in this chapter, including the regulations in Part 20, and that the health and safety of the public will not be endangered." Each of Petitioner's contentions ultimately goes to the fact that either the information included in the application, the past operating practices and history, or current characteristics of the reactor, indicate that the Applicant has not met the burden necessary to support the issuance of an operating license.

I. APPLICATION GROSSLY INADEQUATE

The Application--including the supporting appendices--is so substantially flawed that it fails to meet even minimal standards for such applications and fails to adequately demonstrate that the health and safety of the public will be properly protected if the license is granted, thus making approval of the Application impossible on the basis of its inadequacies alone.

Specifically,

1. Omission of essential information.

a. Applicant stated on page II/3-1 of Application:

> The UCLA Reactor has been subjected to experimental vibration. The results were reported by C.B. Smith at the Winter Meeting of the American Nuclear Society, November, 1968, in a paper titled "Vibration Testing and Earthquake Response of Nuclear Reactors."

However, Applicant failed to state that the UCLA reactor failed the test in question and that damage to the reactor was so severe that a control blade eventually stuck in the out position, requiring dismantling of the reactor core, necessitating substantial radiation exposure to repair workers and raising serious questions about the safety of the UCLA reactor in case of an earthquake. The report the Applicant cites above without describing its contents states the following:

> About six months after the vibration experiment routine tests indicated that one of the control blade insertion times had increased. A few months later safety blade No. 1 stuck in the "out" position during a routine prestart checkout of the reactor control system.
>
> When the reactor was dismantled, we discovered that lead shielding bricks had been displaced upward, causing the shaft to bind.
>
> "Vibration Testing", p. 24

b. In identifying agents responsible for the reactor construction and design, Applicant failed to mention that the company that built the reactor, AMF, is no longer in the reactor business and that this has led to difficulties in getting spare parts:

> Some of the reactor instrumentation is still workable, but sometimes unreliable, and is very difficult to repair due to its age and the resultant problem of obtaining parts (e.g., vacuum tubes, specialized switches, indicators, and meters).
>
> NEL 1976 Annual Report, p. 35

c. Despite certification (notarized) by Dean O'Neill, Dr. Wegst, and Vice Chancellor Hobson on page 10 of the Application that they

> certify that these applications are prepared in conformity with Title 10, Code of Federal Regulations, Parts 50 and 70, and so solemnly swear (or affirm) that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief

there is virtually no other mention of Part 70 in the entire document. The document has not been prepared in conformity with 10 CFR 70 (the requirements for applications for Special Nuclear Materials licenses) and virtually none of the information required by 10 CFR 70 is included.

2. Submission of an original application.

An elementary requirement for an adequate application for facility license is that it be written about the facility for which the license is being applied. And yet much of the Application submitted by the University of California is not original but was lifted verbatim from a 20-year-old Hazards Analysis and from a 6-year-old AEC memo on research reactors as a group. Dr. Wegst, in the cover letter to the Application, admits that "this application contains only minor changes (listed in the forward to appendix 5) from the orginal [sic] application."

The failure to write an original application about this specific reactor as it exists today and as it is likely to exist during the 20-year period for which it has requested a license is so fundamental as to call into question the good faith of the Applicant's effort and mandates the summary rejection of the Application.

a. Safety Analysis Largely a Retyped Version of 1960 Hazards Analysis
The SAR submitted with this application is a virtual verbatim copy, with some pages added and a few passages removed, of the Hazards Analysis for this reactor written twenty years ago. The reactor's characteristics have changed significantly since then, as has the state of nuclear safety knowledge, but the 1980 SAR and the 1960 Hazards Analysis are substantially identical (as can be seen in the samples included herein on pages 17 & 18) In 1960 the reactor was in its own two-story building; today classrooms and offices have been attached on almost all sides. The reactor now operates at 10 times the power, four times the excess reactivity, with a pneumatic rube "rabbit" system not in existence in 1960. Since the Hazards Analysis was written new characteristics such as a positive graphite temperature coefficient and a different void coefficient have been identified. Furthermore, new information is now available about seismology, meteorology, hydrology, and reactor performance. Yet with all this new information available the Applicant merely retyped much of the old 1960 Hazards Analysis with minimal updating and no new analysis. What changes have been made, besides some changes updating such things as population figures, are that the mention of some safety features such as a deflector plate (to prevent repeated excursions)

and limits on excess reactivity to less than that needed for prompt criticality have been removed. All in all, there is no new analysis of the safety of this reactor, merely repition of an outdated analysis. In short, the Applicant has analyzed the hazards of a reactor far different from the one it seeks to have licensed.

b. Lack of original environmental impact appraisal for this reactor. Applicant has ostensibly filed an EIA for this particular reactor, but much of the language has been lifted, without attribution and virtually verbatim, from Daniel Muller's AEC memo of January 23, 1974, on "Environmental Considerations Regarding the Licensing of Research Reactors and Critical Facilities." There is virtually nothing on pages II/3-1 through 7-1 that was written by the Applicant nor can it be said that the contents of those pages represent a review of the environmental aspects of Applicant's specific facility. Applicant made no showing that Muller's general conclusions fit the specific circumstances of UCLA; nor for that matter did they identify the language as anything but theirs.

3. Misleading and inaccurate statements.

a. Page 5 of the Application states that the use to which the facility will be put is:

> the education of senior undergraduate and graduate students in nuclear engineering and related sciences. In addition to formal courses and demonstrations, the reactor will be used to support research at the M.S. and Ph.D. levels.

This statement is at best misleading, because a chart on p. III/1-5 of the Application indicates that last year only 34 hours of reactor operation were spent on instruction. Further, a substantial portion of the reactor's "research" usage is rental and sale of services to commercial concerns, primarily activation analysis for ore assaying. (for details, see contention on "Wrong Class of License.")

b. Applicant states on page 7 of the Application that "no structural weaknesses (earthquake vulnerability) have ever been identified." Yet Professor Catton's 1976 Annual Report states: "The February 1971 earthquake gave rise to minor problems that worsened with time and ultimately required a major maintenance effort in 1972;" a seven-month shutdown. (p.3. 1976 report). Applicant's statement is further contradicted by the earthquake simulation test mentioned in 1.a. above.

c. The Forward to the Technical Specifications (p. V/i) states:

> The Technical Specifications c ntained in this appendix, embody the earlier Technical ecifications (of 1971 as amended in 1976), in revised rmat and expanded content. With four exceptions noted be w, no attempt has been made to alter the content and provi ns of the earlier Technical Specifications, and any other discrepancies should be interpreted as typographical errors or editorial deficiencies.

Notwithstanding the above assertion by Applicant, significant ch nges besides the four noted in the Forward have been made in the T ch Specs included in the Application. Whether their cause be typogr phical errors, editorial deficiencies, or attempts to alter the content, the following changes appear to have been made without so stating:

i. the requirement for an annual heat balance-inst ument calibration has been removed.
ii. the definition of "annual" for the remaining ca ibrations has been changed from once every 12 months to once ever 14 months.
iii. the excess reactivity limitation has been changed from 2.3% Δ k/k to \$3.54, apparently utilizing a β of .0065. If the β of the 1960 Hazards Analysis, upon which the change to 2.3% was based, were used, that would mean an actual increase of excess reactivity to 2.62% k/k, without any approval or request for approval.

iv. removal of language requiring that ALARA be met.
v. removal of specifications regarding height of exhaust stack and flow rate of emissions out of exhaust stack.

The above items are discussed in more detail in the contention about the Technical Specifications.

d. Applicant on page III/3-1 lifts verbatim the language of the 1960 Hazards Analysis that

> No deep wells have been drilled on the campus or in the vicinity of the campus. The water table is estimated to lie 200 feet below the surface of this area.

However, page 19 of these contentions shows a hydrology map for the area indicating that there are a number of wells near the campus.

e. Applicant on p. II/3-1 lifts verbatim the language of p. 3 of the Muller AEC memo that

> Accidents ranging from failure of experiments to the largest core damage and fission product release considered possible result in doses of only a small fraction of 10 CFR 100 guidelines and are considered negligible with respect to the environment.

However, p. III/B-6 of the Application indicates that in event of an accident Applicant's own estimate includes a thyroid dose to members of the public of 1800 rem to the thyroid, considerably in excess of the 10 CFR 100 guideline of 300 rem thyroid dose. (See contention regarding Failure to Meet 10 CFR 100 Guidelines.)

4. Unsupported and/or unsupportable statements.

a. Applicant on page II/5-1 essentially repeats the Muller language,

> There are no suitable or more economical alternatives which can accomplish both the educational and the research objectives of this facility.

Applicant fails to support this statement with any serious consideration of the alternatives. (see contention on Environmental Impact Appraisal).

b. Page V/3-6 of the Application states

> SPERT and BORAX tests showed that plate type fuel elements survived step reactivity insertions of \$3.54.

As a careful reading of Appendix A of the SAR indicates, SPERT and BORAX tests showed no such thing. It was merely extrapolated from BORAX data, which was for a water-moderated reactor, not a water and graphite moderated one like the UCLA reactor, that .6% Δ k/k was relatively safe because it wasn't until one got in the range of 2.3% Δ k/k that a cladding melt could occur. As is seen in the Appendix marked Figure D-5 in the Hazards Analysis, there is no BORAX data available in that range. Furthermore, the translation of 2.3% Δ k/k into \$3.54 is highly questionable because of the use of a β that differs from the one used in the intial analysis. (For a detailed discussion, see contention on excess reactivity.)

CONCLUSION

The above citation of omissions, misleading statements, inaccuracies and inadequacies contained in the Application represent but a small number of such items that have been found by Petitioner. However, further detailing of these items would be burdensome on all parties at this stage because of their great number. Furthermore, many of the items not included here are included in other contentions. It has been our intent merely to show sufficient basis for our contention regarding the inadequacy of the Application itself.

The above citations are sufficient to present a picture of an Application which is grossly inadequate to meet the requirements for the issuance of a reactor license. There is clearly insufficient accurate information about the facility as it now exists and is likely to exist during the proposed license period to serve as a basis for the Board to conclude that the reactor will be operated in a manner which complies with the regulations and which will not endanger the public health and safety. One of the principal burdens upon an applicant for license is the preparation of an adequate application. Without such an adequate application it is impossible for the requested license to be issued.

Furthermore, the omissions and misleading and inaccurate statements are so serious as to call into question Applicant's compliance with Section 186 of the Atomic Energy Act of 1954 (42 U.S.C. § 2236) as interpreted in Virginia Electric & Power Co. (North Anna Power Station, Units 1 & 2) ALAB-324, 3 NRC 347, (1976).

3.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS

Accidents ranging from failure of experiments to the largest core damage and fission product release considered possible result in doses of only a small fraction of 10 CFR Part 100 guidelines and are considered negligible with respect to the environment. The UCLA Reactor has been subjected to experimental vibration. The results were reported by C. B. Smith at the Winter Meeting of the American Nuclear Society, November, 1968, in a paper titled "Vibration Testing and Earthquake Response of Nuclear Reactors".

no mention that it failed the test — the experimental vibration caused damage to the core and a control rod became pinned — in the "out" position!

 from App

VIBRATION TESTING AND EARTHQUAKE RESPONSE OF NUCLEAR REACTORS

REACTOR SITING

KEYWORDS: reactors, reactor safety, vibrations, testing, seismology, research reactors, mathematics, sensitivity, stability, analysis, motion, earthquakes, UCLA, EGCR, CVTR

CRAIG B. SMITH and R. B. MATTHIESEN *Nuclear Energy Laboratory, Earthquake Engineering and Structures Laboratory, Los Angeles, California 90024*

Received November 25, 1968
Revised February 24, 1969

Vibration testing of nuclear reactors is discussed as a part of the determination of the response of such systems to earthquakes. The basic theory of vibration testing is presented along with a comparison of impulse, ambient, and steady-state testing. Steady-state tests provide a method of obtaining the complete dynamic characteristics of a system and of selectively studying each of the components of the system; e.g., containment, steam generator, pressure vessel, instrumentation, etc. Generally, both impulse and ambient studies do not provide as much detailed information while being less time consuming and creating less interference with other operations.

A series of tests performed on the UCLA research reactor, the Carolinas-Virginia Tube Reactor, and the Experimental Gas-cooled Reactor at Oak Ridge are used to illustrate results obtained with steady-state tests. These illustrate the effect of the vibrations on instrumentation as well as the response of the reactor cores, fuel elements, biological shielding, steam generators, exhaust stacks, and the containment structures. The tests of the UCLA reactor included tests with the reactor at full power. The examples illustrate the complexity of the soil-structure-reactor system while also indicating the nature of the results which may be obtained with vibration tests.

INTRODUCTION

Knowledge of the effects of earthquakes on nuclear reactor safety will be increasingly important as more nuclear power plants are constructed in seismic regions. Until the time when we have experienced the actual behavior of large power reactors in strong motion earthquakes, it will be necessary to predict their performance with studies based on simulations and analysis.

To discuss vibration testing of nuclear reactor systems, one needs to consider the use that will be made of the tests. The obvious use is to determine the dynamic response of key reactor systems. We believe that this is important, but it is also important to use the test results to check the validity of mathematical models of structures. There is considerable need for analytical models that will accurately predict the response of large nuclear power plants to the vibration effects of earthquakes.

Much work has been done in the fields of seismology and earthquake engineering, and we believe that it is possible today to construct a "first approximation" to a complete analytical model. We are surveying this work and are attempting to draw it together to construct an overall model. Where possible, we plan to use our own experimental work or the work of others to verify the model.

In addition, we expect that the experimental work we have done will indicate areas, if any, where nuclear power plant design requires further research and development. Once a complete analytical representation of the earthquake-soil-structure nuclear reactor system is available, it will be possible to study the sensitivity of the model to variations of its parameters. Sensitivity analyses can pinpoint areas in the system where additional research is required or where additional research would lead to significant improvements in the stability or safety of the system.

In this paper we discuss some analytical models and several experimental techniques for testing reactor structures. We compare the advantages and disadvantages of the several testing techniques, based on our experience in the field

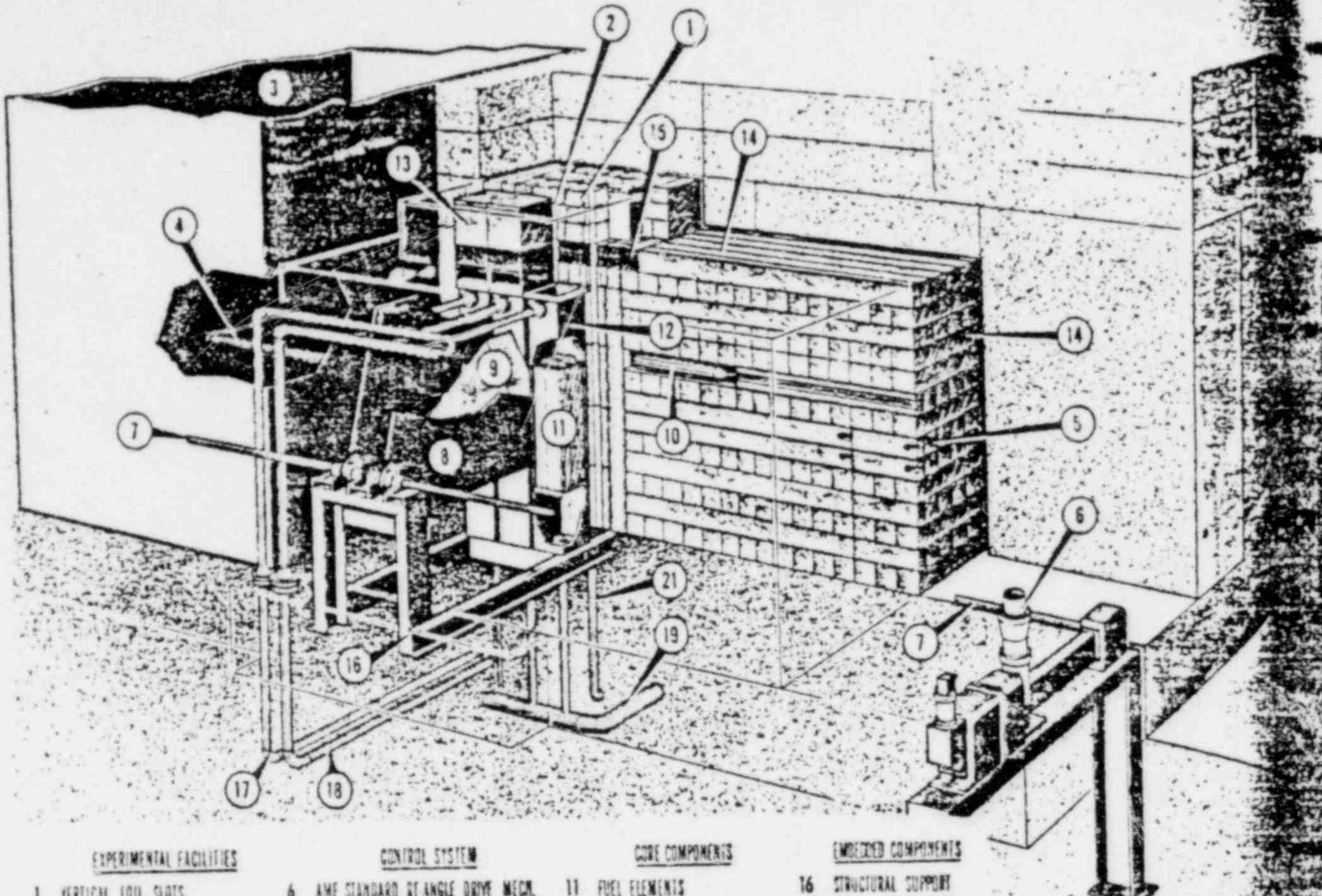

Fig. 19. UCLA reactor-core area.

None were observed. About 6 months after the vibration experiment routine tests indicated that one of the control blade insertion times had increased. A few months later safety blade No. 1 stuck in the "out" position during a routine prestart checkout of the reactor control system.

When the reactor was dismantled, we discovered that lead shielding bricks under the control blade drive shaft had been displaced upward, causing the shaft to bind. The lead shield blocks were stacked on lead shot which had been poured in the void spaces between the graphite and biological shield. Subsequently the lead shot has been canned in steel containers, and a steel shroud has been welded in place to protect the drive shaft from interference.

The response of the EGCR core (Figs. 22 through 24) is interesting. The acceleration curves (north-south shaking) for both the center of the graphite columns and the top grid plate show peaks, one at ~3.9 cps and another at 4.2 cps. forced vibration tests reveal that the peak 4.2 cps is the primary response of the build the 3.9-cps response is due to the core its When the shaking direction is switched to E the grid plate has a sharp peak at 4.6 cps, w is equal to the natural frequency of the building the east-west direction.

Figure 25 shows another interesting aspect EGCR core response. The grid plate resp indicates the unstable jump phenomenon associated with a nonlinear softening spring. As frequency of the forced vibrations increases, amplitude of accelerations increases uniformly 8.87 cps. At 8.90 cps, the amplitude nearly doubles, and then falls off at higher frequency. W the forced vibration frequency is lowered, acceleration amplitude retraces the same cu

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Section 50.34

a. Not applicable

b. Final Safety Analysis Report, (FSAR)

An FSAR, the Argonaut Safety Analysis Report (ASAR) is included with this application.

(1) Environmental monitoring results are discussed in the Technical Specifications, Appendix V, Section 7.0.

(2) See the ASAR, Appendix III.

(3) See the Environmental Impact Appraisal (EIA), Appendix II.

(4) No structural weaknesses (earthquake vulnerability) have ever been identified. The biological shield was augmented in 1963 when the reactor power was increased to 100 kwt. Aluminum primary coolant lines, embedded in concrete beneath the reactor core and shield, were replaced (by-passed) by new lines in 1971 because of (external) corrosion problems. The originally planned PuBe start-up was replaced by a RaBe source prior to initial operation. The RaBe source was replaced in 1976. Ventilation stack monitoring problems (type of monitor and calibration) were prevalent until 1975. The present monitor, a 4 liter, flow-through ion chamber, is believed to be quite satisfactory.

(5) Safety questions raised during the Construction Permit stage are unknown at UCLA today.

(6) (i) An organization chart is provided in the Technical Specifications, Figure V/6-1. Principal responsibilities are designated. "Demonstrated Ability" is the most common personnel qualification at intermediate and higher administrative levels.

(ii) Not applicable.

(iii) Not applicable.

(iv) Plans have been replaced by Technical Specifications, Appendix V, and (implicitly) Procedures.

(v) An Emergency Response Plan is included in this application, Appendix IV.

(vi) Technical Specifications are included in this application, Appendix V.

(vii) Not applicable.

from Application

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ANNUAL REPORT

NUCLEAR ENERGY LABORATORY

January 1, 1976 to December 31, 1976

Ivan Catton, Director

subsidiary repairs. It is not possible to visually inspect the core other than by entry, and it is not practical to provide routine preventive maintenance within the core.

The February 1971 earthquake gave rise to minor problems that worsened with time and ultimately required a major maintenance effort in 1972. A coolant leak late in 1974 required reactor down-time from mid-August to early December. The reactor was down from April 15 to July 3, 1975, pending resolution of a Nuclear Regulatory Commission concern over argon-41 emissions, and again from November 23, 1975 to March 18, 1976 to replace a leaking encapsulated neutron source. At the present writing, May 1977, the reactor has continued to be operational since March 1976, and no major maintenance has been required since December of 1974. There are no current symptoms indicative of a significant maintenance requirement.

Technological changes influence reactor demand, and adaptability to change through finding new markets for reactor services continues to influence reactor productivity. The reactor is no longer new, and reactor physics research projects with the UCLA reactor have become non-existent. The advent of the Medical Cyclotron on the UCLA campus has displaced the reactor in the field of medical radioisotope production. But, new interests in activation analysis by geophysicists, geologists, and meteorologists have replaced these vanishing activities. Of course, the reactor continues to be a valuable instructional tool both for the academic and the non-academic community. The current reactor activities are discussed in Chapters IV and V of this report. Non-reactor activities of the laboratory are becoming a financially significant factor for the NEL and are described in Chapter VI. Chapter IX describes new from application 14

4.0 UNAVOIDABLE EFFECTS OF FACILITY CONSTRUCTION AND OPERATION

The unavoidable effects of construction and operation involves the materials used in construction that cannot be recovered and the fissionable material used in the reactor. No adverse impact on the environment is expected from either of the unavoidable effects.

5.0 ALTERNATIVES TO CONSTRUCTION AND OPERATION OF THE FACILITY

There are no suitable or more economical alternatives which can accomplish both the educational and the research objectives of this facility. These objectives include the training of students in the operation of nuclear reactors, the production of radioisotopes, its use as a source of neutrons for neutron activation analysis, and also its use as a demonstration tool to familiarize the general public with nuclear reactor operations.

6.0 LONG-TERM EFFECTS OF FACILITY CONSTRUCTION AND OPERATION

The long-term effects of a research facility such as the UCLA Nuclear Energy Laboratory are considered to be beneficial as a result of the contribution to scientific knowledge and training. This is especially true in view of the relatively low capital costs involved and the minimal impact on the environment associated with a facility such as the UCLA Nuclear

7.0 COSTS AND BENEFITS OF FACILITY AND ALTERNATIVES

The cost for a facility such as the UCLA Nuclear Energy Laboratory is on the order of $1 million with very little environmental impact. The benefits include, but are not limited to:

(a) education of students and public:

(b) research (activation analysis and production of short-lived isotopes); and

(c) training.

Some of these activities could be conducted using particle accelerators or radioactive sources, but these alternatives are at once more costly and less efficient. There is no reasonable alternative to a nuclear research reactor of the type presently used at the Nuclear Energy Laboratory for conducting the broad spectrum of activities indicated above.

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

J. L. 15

JAN 28 1974

D. Skovholt, Assistant Director for Operating Reactors, L

ENVIRONMENTAL CONSIDERATIONS REGARDING THE LICENSING OF RESEARCH REACTORS AND CRITICAL FACILITIES

Introduction

This discussion deals with resea[illegible] which are desi[illegible]

Unavoidable Effects of Facility Construction and Operation

The unavoidable effects of construction and operation involves the materials used in construction that cannot be recovered and the fissionable material used in the reactor. No adverse impact on the environment is expected from either of these unavoidable effects.

Alternatives to Construction and Operation of the Facility

To accomplish the objectives associated with research reactors, there are no suitable alternatives. Some of these objectives are training of students in the operation of reactors, production of radioisotopes, and use of neutron and gamma ray beams to conduct experiments.

Long-Term Effects of Facility Construction and Operation

The long-term effects of research facilities are considered to be beneficial as a result of the contribution to scientific knowledge and training.

Because of the relatively low amount of capital resources involved and the small impact on the environment very little irreversible and irretrievable commitment is associated with such facilities.

Costs and Benefits of Facility and Alternatives

The costs are on the order of several millions of dollars with very little environmental impact. The benefits include, but are not limited to, some combination of the following: conduct of activation analyses, conduct of neutron radiography, training of operating personnel and education of students. Some of these activities could be conducted using particle accelerators or radioactive sources which would be more costly and less efficient. There is no reasonable alternative to a nuclear research reactor for conducting this spectrum of activities.

Table III/1-2

REACTOR ANNUAL USE		
Year	Number of Runs	Megawatt Hours
1973	76	13.8
1974	76	14.8
1975	91	11.9
1976	82	13.1
1977	106	15.9
1978	132	20.3
1979	149	29.0

Table III/1-3

REACTOR ACTIVITY							
Activity	Hours per Year						
	1973	1974	1975	1976	1977	1978	1979
Research	145	177	146	158	188	244	411
Class Instruction	46	28	39	27	88	60	34
Maintenance	12	52	31	23	14	36	1
TOTAL	203	257	216	208	290	340	446

(Note by Bridge the Gap:
p III/1-3 defines maintenance
as maintenance tests on instrument
calibrations required by the
reactor's Technical Specifications.
We argue that the Tech Specs
requirements cannot possibly
be met in 1 hour)

1960 ... Amend. 17

SECTION I

A. REACTOR SITE

The reactor is located in a newly-constructed, permanent, reinforced concrete building on the campus of the University of California at Los Angeles. The location of the building and its relationship to its surroundings is indicated in Figure I-1.

The normal building populations during a school day are given in Figure I-2. At times other than school days, campus building populations are reduced to small fractions of the figures shown.

The 400-acre campus is located on coastal plain approximately five miles east of the Pacific Ocean and 15 miles west of the Los Angeles civic center. To the south of the campus is a business and shopping district, and to the north, west and east are residential areas. A map of this general area is given in Figure I-3.

Geology

The UCLA campus is situated on a coastal plain, and is approximately 400 feet above sea level. The coastal plain consists of a terraced alluvial fill, 200 feet deep at the reactor site, overlying sedimentary rock of rather recent origin. The coastal plain lies at the base of the Santa Monica Mountains which are 2000 feet high. The most important formation in these mountains is Santa Monica slate, an old sedimentary layer 2000 feet thick. Overlying this slate stratum are several more recent sedimentary layers. A cross section of the coastal plain near the campus is given in Figure I-4. This section is at right angles to the anticlinal folding of the Santa Monica Mountains.

Hydrology

No deep wells have been drilled on the campus of UCLA or in the vicinity of the campus. The water table is estimated to lie 200 feet below the surface in this area. A log of a typical test well made by a foundation engineer near the site of the reactor building is shown in Figure I-5.

Surface runoff water is collected in concrete-lined storm drains which empty into the ocean. This drainage system has been adequate to prevent any flooding of the campus by heavy winter rains. The maximum rainfall in any 24-hour period during the last 75 years was ten inches, as indicated in Figure I-6. It is barely conceivable that runoff from the watershed area north of the campus could flood Westwood Boulevard and the area to the west of the reactor site. However, the reactor core lies about ten feet above this level, and a rainfall equal to the largest ever recorded would not flood the reactor. In the unlikely event that such flooding should occur, it would pose an extreme operational inconvenience, but would not create any radiation hazard.

Seismology

Southern California is seismically active. The locations of known active faults are indicated in Figure I-7. The nearest of these to the reactor site is the Inglewood fault running in a north-westerly direction about two miles east of the campus. In Southern California, the region from the Mojave Desert to beyond the off-shore islands is traversed by a series of active faults. These faults extend from 20 to 50 to many hundreds of miles in length, and the trend is generally between north and west. However, they are only roughly parallel, and in certain instances a major fault zone divided into two or more well defined faults. In general, these faults are from five to twenty miles apart and apparently extend to depths of 15 or more miles below the surface.

3.0 GENERAL PLANT DESCRIPTION

3.1 SITE LOCATION

The reactor is located on the 400 acre campus of the University of California at Los Angeles. It is housed within the Nuclear Energy Laboratory (NEL) in a specifically designed and constructed reinforced concrete building.

3.2 SITE GEOLOGY

The UCLA campus is situated on a coastal plain, and is approximately 400 feet above sea level. The coastal plain consists of a terraced alluvial fill, 200 feet deep at the reactor site, overlying sedimentary rock of rather recent origin. The coastal plain lies at the base of the Santa Monica Mountains which are approximately 2000 feet high. The most important formation in these mountains is Santa Monica slate, an old sedimentary layer 2000 feet thick. Overlying this slate stratum are several more recent sedimentary layers.

3.3 SITE HYDROLOGY

No deep wells have been drilled on the campus of UCLA or in the vicinity of the campus. The water table is estimated to lie 200 feet below the surface of this area.

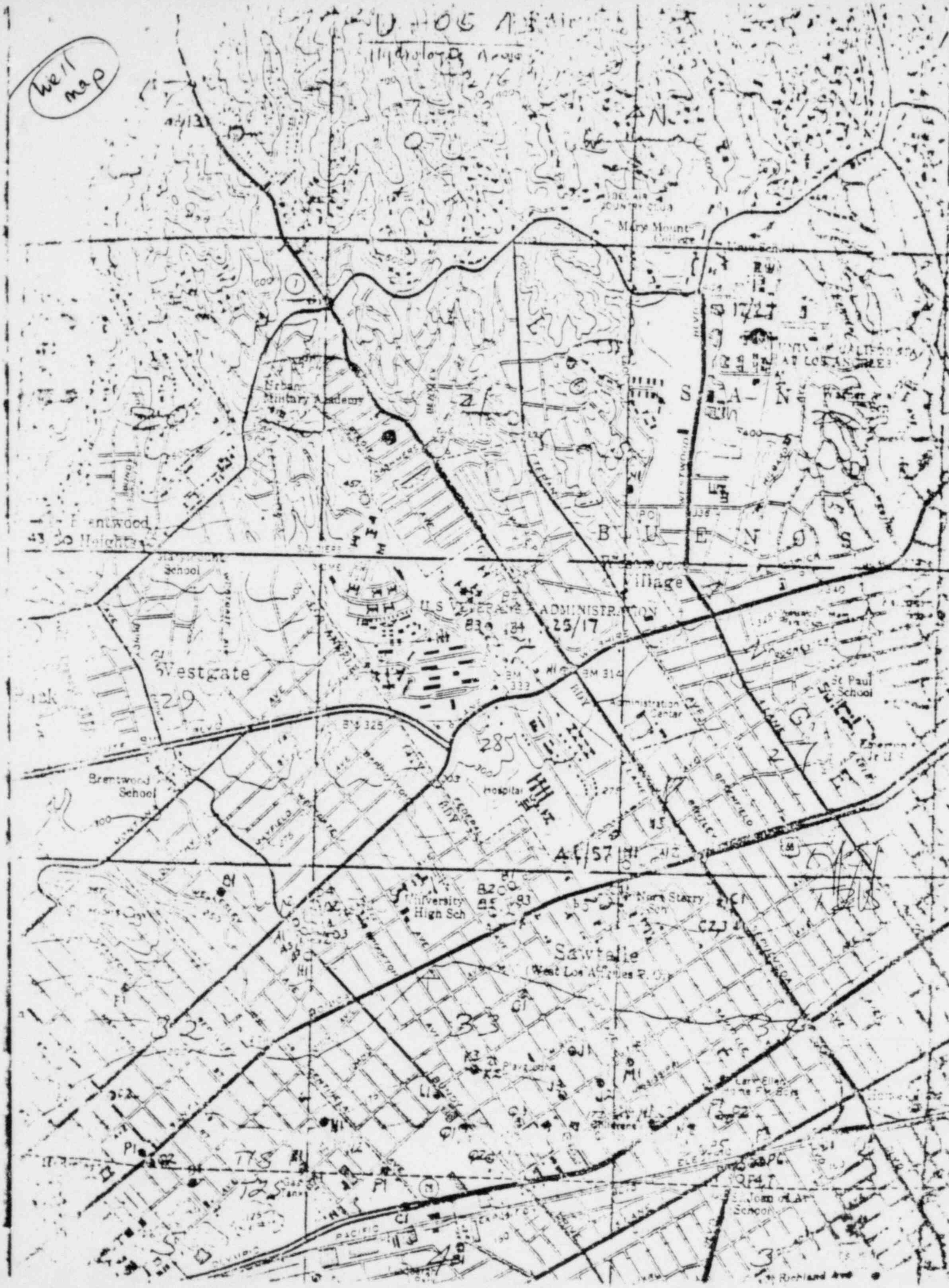
Surface runoff water is collected in concrete-lined storm drains which empty into the ocean. This drainage system has been adequate to prevent any flooding of the campus by heavy winter rains. The maximum rainfall in any 24-hour period during the last 75 years was ten inches. It is barely conceivable that runoff from the watershed area north of the campus could flood Westwood Boulevard and the area to the west of the reactor site. However, the reactor core lies about ten feet above this level, and a rainfall equal to the largest ever recorded would not flood the reactor.

3.4 SITE SEISMOLOGY

Southern California is seismically active. The nearest major fault to the reactor site is the Inglewood fault running in a north-westerly direction about two miles east of the campus. In Southern California, the region from the Mohave Desert to beyond the off-shore islands is traversed by a series of active faults. These faults extend from 20 to 50 to many hundreds of miles in length, and the trend is generally between north and west. However, they are only roughly parallel, and in certain instances a major fault zone is divided into two or more well defined faults. In general, these faults are from five to twenty miles apart and apparently extend to depths of 15 or more miles below the surface.

Earthquakes have occurred in California for a long time in the geologic past, and it is extremely probable that they will recur from time-to-time in the future. In the southern coastal section, shocks well map

19



Urban Military Academy
Mary Mount College
Brentwood Heights
Westgate
U S Veterans Administration
Village
St Paul School
Administration Center
Hospital
Brentwood School
University High Sch
Nora Sterry Sch
Sawtelle
St Joan of Arc School
Richland Ave
Pacific

II. WRONG CLASS OF LICENSE

The Applicant has applied for the wrong class of license. Applicant has applied for a Class 104 license despite the fact that in the past, more than fifty percent of reactor funding and more than fifty percent of the hours of reactor usage have been devoted to the sale of services, rather than research or education. Given this history, and without any indication that Applicant intends to change reactor usage, Applicant under 10 CFR 50.21(b) and 10 CFR 50.22, should have applied for a Class 103 license.

a. Applicant's financial statements indicate that more than half of the reactor funding comes from sources other than the UCLA School of Engineering and Applied Sciences (SEAS).

1. Applicant states on page I/1-1 of the application that 52.5% of the NEL income in 1979 came from "reactor earnings" and "other income", and that these two categories are projected to increase to 58% of the 1980 earnings.

2. Applicant also indicates on page I/1-1 that in 1979 and 1980 less than half of NEL's funding came from SEAS "in pursuit of the University's teaching and research mission."

b. Information provided by the application, though lacking sufficient detail to support definitive assertions, indicates that more than half of the reactor operating time is spent on commercial, non-educational projects.

1. Instruction accounts for only a small portion of the reactor operating hours. An examination of the table provided on page III/1-5 of the application shows that in 1979 less than 8% of the

reactor operating time was devoted to instruction, and that over the last seven years, instruction has averaged only 16.4%.

2. Research, the only other category of non-maintenance reactor operating time listed in the application, combines both commercial and non commercial projects. Statements by the reactor staff indicate that the reactor hours for non-scholarly commercial use account for a majority of the 411 hours listed in the table on page III/1-5 of the application as "research" hours. The application indicates that the "greatest number of research hours are for activation analysis (both γ-ray spectroscopy and delayed neutron counting), and fission track dating projects." (Application at page III/1-3). That the hours spent on activation analysis are likely to have been devoted to commercial projects, rather than bona fide research, can be inferred from the following staff statements:

> One business firm, paying $65/hour to use the reactor, changes the color of gems such as rubies, garnets and topazes to make them more valuable. After the gems are removed from the reactor, they are allowed to lose their radioactive energy and are then shipped to customers.
>
> -information attributed to Charles Ashbaugh of the reactor staff in UCLA Daily Bruin, May 31, 1979

> Dr. Kalil, [who runs a uranium ore assaying business] uses the reactor to determine the economic value of the uranium ore samples through a technique he calls 'neutron activation'.
>
> -same article, UCLA Daily Bruin, May 31, 1979

> Anyone can have a sample analyzed. It costs $75/hour.
>
> -same article quoting Mr. Ashbaugh, UCLA Daily Bruin, May 31, 1979

> Reactor manager Neil C. Ostrander said a substantial portion of the 411 hours classified as research is done for private firms.
>
> Valley News, July 11, 1980, page 14

Trends in the amount of instructional time for which the reactor is used and the intended amount of time the reactor management desires to devote to non-university, commercial activities also indicates that the Class 104 license is inappropriate for the reactor. The 1976 Annual states:

> In order to attract more outside business and to eliminate our reactor user's from shopping elsewhere for a higher neutron flux, the reactor may be slightly altered to go to higher power levels, i.e. 500kw or 1Mw, the current licensed power is only 100kw. The best possible use for this higher power level would be in activation analysis. If the money is found, our antiquated activation analysis laboratory must be modernized. It is currently about 10 years behind the state of the art.
>
> -1976 Annual Report at page 35-36

III. INADEQUATE MANAGERIAL AND ADMINISTRATIVE CONTROLS

Applicant has failed to demonstrate adequate managerial and administrative controls in the Application, as required by 10 CFR 50.34(6)(ii), and, further, has demonstrated throughout its operating history grossly inadequate managerial and administrative controls. These inadequacies make it impossible to find that Applicant's managerial and administrative controls are adequate to responsibly protect the public health and safety.

Specifically,

1. Applicant has failed to provide the information required in 10 CFR 50.34(6)(ii) regarding "managerial and administrative controls to be used to assure safe operation"; this failure makes a finding of adequacy impossible.

On page 7 of Application, in response to information required by 10 CFR 50.34(6)(ii), Applicant has merely responded "not applicable." No explanation is given, nor any information provided. An examination of that section of the regulations provides no clue as to why Applicant views itself as exempt from that section. Indeed, the history of grossly inadequate reactor management and the gravity of the matter for reactor safety would seem to require a substantial documentation of administrative changes to rebut the presumption of inadequacy raised by the reactor's record.

2. Failure to get prior approval from Reactor Use Committee or Reactor Director for changes in reactor systems and for non-standard experiments.

Notice of Noncompliance, dated April 24, 1973:

> Technical Specification VIII H.1 requires that the Radiation Use Committee review proposed changes to the facility, when such changes have safety significance, and shall determine whether they involve an amendment to the license, a change in the Technical Specifications or an unreviewed safety question.
>
> Contrary to this requirement the Reactor Use Committee did not review and make the required findings with respect to the change of the reactor logic system from 110 V a.c. to 28 V d.c.

In a memo from AEC Reactor Inspector W.E. Vetter, dated August 21, 1969, the following area of noncompliance was cited:

> Contrary to Condition 1 of the license, which incorporates the UCLA Training Reactor Hazards Analysis Report dated March 1960, the reactor was operated for the purpose of conducting a beam tube experiment during periods of non-standard reactor operating conditions (bypassed scram circuitry). The periods of nonstandard reactor operation were not approved by the laboratory Director nor had they been reviewed by the Reactor Hazards Committee. The requirements for review and approval for nonstandard reactor operation are described on page 49 of the UCLA Training Reactor Hazards Analysis Summary Report.
>
> (emphasis added)

Note that the failure of administrative and managerial oversight resulted in what could have been an extraordinary safety hazard--the bypassing of scram circuitry.

3. Failure to get prior approval from the Commission for facility changes.

Memo, Spencer to O'Reilly, covering inspection report 50-142/69-01, memo dated July 15, 1969, states:

> ...one of the items of noncompliance involves a significant facility modification (which was not authorized by the Commission as required by the facility license) and represents, for all intents and purposes, a repeat item of noncompliance. That is, following the previous inspection, the licensee agreed, categorically, that no facility changes of any significance would be carried out without prior approval by the Commission.

Senior Reactor Inspector Spencer continues:

> As you know, we had previously been extending "tacit approval" for type 50.59 changes for this facility in the absence of technical specifications (and contrary to the requirements of the license) so that the licensee could continue a vigorous program requiring reasonable flexibility in the area of expeditious facility modifications. However, during the previous inspection we concluded that the licensee had <u>overstepped "reasonable bounds"</u> (see cover memo, CO Report No. 50-142/68-2) and consequently, we informed both the Reactor Director and the Assistant Reactor Director that any future modifications to the facility would require Commission approval. Both of the aforementioned individuals agreed, without reservation, to the new limitations on the basis of the facility license requirements. <u>Obviously, the licensee has failed to adhere to the requirements of the license</u>...
>
> (emphasis added)

Thus, there is considerable basis for the concern that the facility has in the past been modified without prior Commission approval, that the problem has been a repeat problem, and that lack of administrative and managerial control (absence of Reactor Director) is in part the cause. A review of the Application and recent inspection reports gives no indication that these problems have been substantially resolved. The concern that the facility could be modified without prior Commission approval raises many serious safety concerns, among them that excess reactivity limits, already dangerously high, could be altered by the licensee by changing fuel loading without prior approval.

4. <u>Lack of involvement of Lab Director and/or Assistant Director for extensive periods; other indications of inadequate supervision</u>. A history of accidents, radiation spills, worker exposures, inaccurate calibrations, violations of regulations and high number of unintentional scrams, among other indications of an inexcusably sloppy operation described in other contentions indicate grossly inadequate supervision.

Commission inspection reports have from time to time come to the same conclusion, and at times cited as cause the lack of involvement of the Director and/or Assistant Director in the daily running of the facility. The Spencer memo cited above concluded by saying:

> Obviously the licensee has failed to adhere to the requirements of the license and although the reasons appears to be lack of involvement on the part of the Reactor Director, rather than deliberate disregard, we have concluded that anything short of CO Headquarters enforcement action would be inadequate.
>
> We feel that the events which led to the items of noncompliance, as well as the poor housekeeping observed during the current inspection, all reflect overly heavy workloads and a lack of clear definition of responsibility insofar as the reactor supervisor is concerned.

In Inspection Report 69-01 we find the following:

> In addition to the apparent noncompliance items listed above, it appears that neither the Director or the Assistant Director of the facility has been actively participating in the day-by-day operation of the facility. For this reason, and because one of the items of apparent noncompliance (unauthorized facility modifications) is essentially a repeat occurrence, Headquarters action was requested.
>
> p. 2

and continuing:

> ...Professor Smith made a brief, unofficial visit to the reactor facility (not concerned with the inspection). At this time, the inspector iterated previous statements relative to the noncompliance aspects of the inspection. <u>The apparent degeneration of housekeeping practices was also discussed</u>. Smith could offer little or no rebuttal, <u>explaining that he had been away from the facility for six months</u>, and expressed essential agreement with the inspector's comments. In response to a stated conclusion on the part of the inspector that <u>Mr. Hornor appeared to be solely responsible for the facility operation without benefit of designated (documented) responsibility</u>, Professor Smith said that this situation was covered by the facility operating procedures and or license correspondence. However, <u>a search of the license records</u> by both Smith and Hornor to verify Smith's statement <u>was fruitless</u>.
>
> p.3 (emphasis added)

5. Unlicensed visitors to the reactor facility have been invited to operate the reactor controls, in violation of 10 CFR 50.54j, k, and l, and 10 CFR 55.2, 55.3a & b, 55.4d & f, and 55.9 a & b.

Despite clear requirements in the above cited regulations that only licensed operators are permitted to operate the controls of a nuclear reactor, for obvious safety reasons, the Applicant has nonetheless invited unlicensed operators to operate the controls.

a. Attempts to have "Open House" visitors operate the controls, including bringing the reactor to scram points "in order to publicly demonstrate reactor safety." The bibliography for this reactor's docket is replete with references to UCLA's desire to permit "Open House" visitors to "manipulate the reactor." For example, a telephone call made on November 10, 1965, by UCLA to the Commission

> requesting exemption of requirements of 10 CFR 50.541 ... so that visitors to their facility can operate their... as part of an open house demonstration on 11-14.

(elipses in the original docket bibliography)

A few months later UCLA sent a letter (dated 2-9-66) which the docket record describes as:

> submitting a rough draft of a pamphlet they propose to distribute next fall when they hold open house, and citing precautionary steps they plan to take before allowing visitors to manipulate the reactor. Also stating that visitors will also be permitted to reach the scram trip points in order to publicly demonstrate reactor safety.

(emphasis added)

The Commission responded in a 3-22-66 letter

> advising that ... DRL does not agree to an exemption from the regulations to permit operation of their reactor, in ref to their ltr of 2-9-66 which discusses "Open House."

This response from the Commission, declining to waive the regulations which prohibit unlicensed personnel from operating the reactor controls, did not end the matter. UCLA, the docket bibliography indicates, sent a letter to the Commission on 6-13-66

> requesting additional consideration to their request that visitors be allowed to participate in the operation of their research reactor, in ref to our [AEC] 3-22-66 ltr re their plans for an "Open House".

And once again the Commission responded:

> we do not consider it advisable to waive the requirements of AEC regulations 10 CFR Part 50 and 55 for this purpose.

b. Recent invitations to movie actors to operate the reactor.

In a length letter to Michael Douglas, who produced and starred in the film *The China Syndrome*, NEL staff criticized the film and said:

> If you wish further elaboration, which is a must due to the complexity of the subject matter, or would like to talk or come by and visit our facility, and even operate our .1 MWth nuclear reactor, please give us a call.
>
> NEL letter to Michael Douglas, April 9, 1979 (emphasis added)

Copies of this invitation were sent as well to the other principals in *The China Syndrome*--Jane Fonda, Jack Lemmon, and James Bridges.

The requirement that only trained and licensed individuals operate nuclear reactors is a very sensible one. It appears from the April 9, 1979, letter to Michael Douglas, Jane Fonda, Jack Lemmon, and James Bridges that the Commission's desire that the sections of 10 CFR 50 and 55 cited above be obeyed still has not sunk in with the reactor staff. With the amount of excess reactivity that is potentially available, and the lack of a containment structure should a radiation release occur, the operation by non-licensed personnel would be a serious threat to public health and safety and indicates very poor administrative and managerial controls.

6. <u>Inadequate record keeping, including loss of key records</u>.

The Applicant has been consistently criticized by the Commission's Inspection and Enforcement division for inadequate record keeping.

a. <u>loss of maintenance log</u>. Notice of Violation dated October 15, 1974:

> Section VIII K.3 of the technical specifications requires that a record be maintained of the principal maintenance activities and reasons therefore.
>
> Contrary to this requirement, the record of maintenance activities prior to May 1974 was missing. (Severity Category III)

As Inspection Report 74-01 stated about the loss of the record (p.4):

> 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 activity had left.

The discussion in the contention regarding inadequate instrument calibration and equipment maintenance indicates how disastrous the loss of this log was. In a November 4, 1974, response to the Notice of Violation, Harold V. Brown, Environmental Health and Safety Officer for the University, replied:

> Section VIII k.3 of the Technical Specifications requires a maintenance log to be kept on the reactor and supporting equipment. This record was lost in April, 1974 before the previous reactor supervisor, Mr. J. Brower, left this facility. It appears that it will never reappear.

Interestingly, inspector G.S. Spencer had said only a few years before (in a May 3, 1971 memo to J.P. O'Reilly) that the problems in record keeping UCLA had had prior to that time were hoped to be resolved by the addition of Brower:

> The recent addition to the reactor staff, Mr. Brower, an ex-nuclear Navy man, appears to be an individual oriented towards

> operations in accordance with written procedures and by the "book." This influence appears to have resulted in more detailed and organized documentation to show that operations have been performed in accordance with licensed requirements.

Unfortunately, the addition of Brower did not end the record-keeping problems.

b. Other inadequate record-keeping. The above mentioned memo from Spencer continued:

> You will note that our inspector discovered an error in the licensee's technical specifications governing the absolute reactivity worth of experiments.

This error was a misplacement of a decimal point, an error of an order of magnitude that was--this time at least--in the safe direction. Should such an error occur in the other direction, serious consequences could result, as is shown in the contention on excess reactivity.

The inspection reports available to Petitioner at this time are filled with citations for inadequate record-keeping. One example is an April 24, 1973 letter from AEC's Spencer to Thornburg:

> The inspection disclosed three items of noncompliance. . . . The inspection disclosed a weakness in the keeping of operating and maintenance records. The most glaring deficiency was associated with the void coefficient experiment. . . . The licensee had no maintenance log record, however, this type of information was found in various locations (i.e., operating log sheets, minutes of the Reactor Use Committee and facility change order safety analyses).

7. Failure to hold administrative meetings and conduct reviews required by the Tech Specs. Notice of Noncompliance, dated April 24, 1973:

> 1. Technical Specification VIII H requires that the Radiation Use Committee meet at least semiannually.
>
> Contrary to this requirement, the Radiation Use Committee had not met since March 23, 1972.

3. Technical Specification VIII H.3 requires that the Radiation Use Committee make an in-depth review of facility operations at least annually.

Contrary to this requirement only one review of facility operations has been made (in December 1972 or January 1973) since the Technical Specifications became effective on March 1, 1971.

Similar problems are reported in other inspection reports.

CONCLUSION

The problems with inadequate administrative and managerial controls are long-standing and there is no indication they have been or will be resolved. The facility has a long history of questionable management. As Spencer wrote to Thornburg, memo, October 15, 1974, transmitting inspection report of September 30, 1974:

> 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.
>
> (emphasis added)

And as R.H. Engleken wrote to UCLA the same day as the Spencer memo was sent, in a cover letter transmitting another notice of violation:

> In addition to the need for corrective action regarding these specific violations, we are concerned about the implementation of your management control system that resulted in these violations. Consequently, in your reply, you should describe in particular, those actions taken or planned to improve the effectiveness of your management control system.
>
> p. 2 (emphasis added)

The history of grossly inadequate reactor management, and the importance of responsible management to the operation of a safe reactor, would seem to require a substantial demonstration of administrative and managerial changes to rebut the presumption of inadequacy raised by the reactor's record. Applicant has failed to make such a demonstration and therefore the present application cannot support issuance of the requested license .

APR 30 1979

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE
LOS ANGELES, CALIFORNIA 90024

Boelter Hall 2567
April 9, 1979

Mr. Michael Douglas
Producer, I.P.C. Films
Post Office Box 900
Beverly Hills, California 90213

COPY

Dear Mr. Douglas:

Last week I went to see "The China Syndrome". I enjoyed it and therefore would like to inform you of some of the technical inaccuracies.

1. The Ventana power plant was rather unusual in that it appeared to be a cross between a Pressurized Water Reactor (PWR) and a Boiling Water Reactor (BWR).
   a. Physical setting was that of a PWR.
   b. The utility's (CG&E) PR description including the flow diagram on how the Ventana reactor worked, is descriptive of a PWR.
   c. The plant terminology or equipment description was that of a BWR.
   d. The accidents were descriptive of a BWR.
2. Assuming that the power plant was a BWR, the plant must have, while Ventana did not, the following: more than one feedwater line, more than one high pressure injection system, a couple of residual heat removal systems, a stand by liquid control system, an automatic depressurization system, and a suppression pool. A licensed commercial nuclear power plant must have these and hence would prevent a meltdown from taking place, assuming though, that they all worked.
3. Nuclear power plants cannot work with the entire high pressure injection system out of service for repair or whatever. The built in electronic safety circuits would prevent the reactor from going to power.
4. All chart pen recorders are preceded by a digital, meter, or CRT readout, so a stuck recorder pen really can only fool fools. Chart recorders are for record keeping or long term time analysis only.
5. The decay heat residual in a reactor core is very dependent on both the power level and the operational time interval at that power level. It takes weeks at full power to build up enough decay heat to provide enough heat to melt uncovered reactor fuel, just after a reactor shutdown.
6. One UO_2 fuel pellet has the equivalent amount of energy of about one ton of coal or 1/100 of a train car of coal, not six car loads.

COPY

7. MHB engineer's quote of,"You are lucky to be alive and that is the same for Southern California," and the "molten core hits ground water and causes a blast of radioactive steam ..." is very exaggerated and blown clear out of proportion. It probably could be termed literary license.

8. The radiation instrument used to find the water leak under the pump was a rad gun which is a current reading device and therefore does not have a speaker which goes click, click, click. You should have used a G-M survey meter for that operation.

9. All nuclear power plants have one area called a two man entry zone, outside the control room, where the turbine can be made to trip off line and cause the reactor to scram; so, you do not need a crew of electricians to cross a million wires to eventually cause a reactor scram.

10. Not every power plant has been given the o.k. by the AEC or later the NRC to be licensed. There were many which have and will be turned down. Just look at the history of our own Los Angeles Department of Water and Power; i.e. Malibu, Bolsa Chica, and San Joaquin Nuclear Projects. These are examples of just one utility's fight to obtain a nuclear power plant.

Due to the above, I would seriously consider laying off your three "engineers"???? from the MHB Technical Associates. All in all, though, a very good accurate action packed factually correct nuclear thriller could and maybe should be made. The acting and the emotional ties to the audiences of "The China Syndrom" made it, but the errors and some of the plot did not quite make it. In a way though, maybe that was good. For example, while we were leaving the theater, we were jumped by a group called the "Alliance for Survival" who were taking advantage of the subject matter of the film for political purposes and therefore were there handing out poorly documented anti-nuclear literature. This was when I became upset. Why can't a good nuclear thriller be made without having all of the hidden "heavy man" stuff be generated afterwards. I know you said you tried in your (especially Fonda's remarks) during publicity campaigns for the movie. I hope that the audiences do not turn against nuclear power but just enjoy the movie, or we may really be in trouble some day. Look at OPEC price increases, gasoline prices, our poor trying to make it into the middle class, and of course, then use more energy. With a few years of increasing demands for energy, and a possible curtailed nuclear power industry, we then may have to rush back into nuclear and increase the possibility of a china syndrome, or go to war for oil. Whatever you do, you do have more sway with the general public than you probably should have. But that's my own value judgment. You do have the sway, and I hope you do use it, and not abuse it, for the good of your audiences.

One last comment; I'd like to redefine the term China Syndrome as "A psychological euphoric malady common among anti-nukes, characterized by a paranoid fear of a reactor core melting through the center of the earth and popping out in China, where it presumably irradiates the natives on both sides". The China Syndrome so to speak has really been blown out of proportion. If a meltdown would occur, the most likely effects would be

COPY

a large loss of money and equipment to the utility involved, a lot of workers would catch a few extra rays cleaning up the mess, but I seriously doubt that the general public would feel any real effects. We have had several partial meltdowns in the past, i.e. EBRI, Fermi, and Three Mile Island. Only the last one involved a release of radioactive gas and this occurred either due to operator error or to premature transfer of radioactive water out of the containment building. A lot was learned and then implemented after the Browns Ferry fire and the same will occur after the Three Mile Island incident is fully investigated. So, I'd say, keep the faith and remember that risk versus benefit, and apply this to all other forms of generating electrical energy. I have, and that's why I'm a pro-nuke.

Well, thank you for taking the time to read this letter, if indeed it got that far. If you wish further elaboration, which is a must due to the complexity of the subject matter, or would like to talk or come by and visit our facility, and even operate our .1 MW_{th} nuclear reactor, please give us a call.

Sincerely yours,

Charles E. Ashbaugh

Charles E. Ashbaugh, M.S., P.E.
Associate Development Engineer/Lecturer
UCLA Nuclear Energy Laboratory

825-2040, 825-2825

CEA/li

cc: Jane Fonda
Jack Lemmon
James Bridges

IV. VIOLATIONS OF NRC REGULATIONS

Applicant has been consistently been cited for violations of NRC regulations as well as violations of the provisions of its own Technical Specifications. This consisten pattern of regulatory non-compliance and the lack of assurances that the pattern will not continue in the future, indicates that the Applicant cannot adequately demonstrate that future operation of the facility will comply satisfactorily with the regulations to protect the public health and safety.

From the inspection reports available to Petitioner prior to the establishment of a public reading room for this docket and the granting of discovery rights a persistent pattern of violation of regulations, averaging roughly one per inspection, is evident. Some of these cited violations are:

1. Operation on two occaisions with the secondary coolant fission product monitor scram circuitry bypassed. 8/69
2. Operation on two occaisions with core excess reactivity greater than permitted during certain kinds of experiments. 8/69
3. Conducting a beam tube experiment during periods of non-standard operating conditions (by-passed scram circuitry); failure to get prior approval from Lab Director and Reactor Hazards Committee. 8/69
4. Failure of the Radiation Use Committee to make an in-depth review of facility operations at least annually. 4/73
5. Failure of Use Committee to meet at least semi-annually. 4/73
6. Failure of Use Committee to give prior review to proposed facility changes. 4/73
7. Record of maintenance activities prior to May 1974 missing. 11/74
8. Contrary to technical specifications, acceleration nozzle had been removed from the reactor exhaust stack. 11/74

9. Failure to calibrate the reactor room area radiation monitors and the radioactive gaseous effluent monitor at the required frequecny. 1/75

10. Ventilation exhaust air from the reactor room not being diluted to 14,000 CFM and not being released at 125 feet above ground level as required by the Technical Specifications. 1/75

11. Changes to the operating procedures not approved in writing by the Reactor Supervisor.

The history of violations of NRC regulations and Applicant's Technical Specifications set forth above are based on the limited number of inspection reports now available to Petitioner. However, the pattern of persistent violations is clear. Given this history of regulatory violations, Applicant must demonstrate changes in its operation that will reduce such violations in the future. Applicant has failed to make such a demonstration and therefore has not provided reasonable assurances that the operation of the reactor will be conducted in compliance with the regulations. A finding of such assurances is required by 10 CFR 50.57(3)(ii) before an operating license may be issued.

V. TOO MUCH EXCESS REACTIVITY

The amount of excess reactivity which is permitted by the Technical Specifications to be installed in this reactor is too great in that it is potentially sufficient to cause a serious power excursion which could bring about melting of the fuel cladding and significant release of fission products, seriously endangering the public health and safety.

Specifically,

1. The amount of excess reactivity permitted in a facility such as this which is used at times for the instruction and training of students must be quite limited in order to leave a large margin of safety.

The 1960 Hazards Analysis for this reactor made quite clear the requirements that a training facility such as this one must meet in order to be a safe facility at which training could take place:

> A reactor which is to be used for student instruction must be designed so that safety is insured without exercising greater restraint on the activities of students than is normally advisable in a university laborator. This necessitates: (1) that the total available excess reactivity be limited to something less than that needed for prompt criticality; (2) that the reactor have a high degree of demonstrated inherent safety; and 3) that it be limited to low-power operation.
>
> p. 19, Hazards Analysis

Petitioner will outline in what follows considerable basis for the concern that the three factors determined by the writer of the afore-mentioned Hazards Analysis as essential for the safe operation of this facility have each in the subsequent years been considerably mitigated.

2. The reactor has lost several significant self-limiting features

since it was originally licensed.

a. The excess reactivity has been substantially increased over the level necessary for prompt criticality. (see item 3 below).

b. The deflector plate to prevent repeated excursions appear to have been removed. (see contention on lack of adequate safety features).

c. The assumption that the reactor has a large negative temperature coefficient appears to be erroneous because of the positive graphite temperature coefficient. (see contention on safety features).

d. the power of the reactor has increased from 10 kw to 100 kw. The absence or mitigation of each of these self-limiting features reduces the margin of safety that was originally assumed to exist at this facility.

3. The excess reactivity permitted in the reactor is no longer less than that needed for prompt criticality.

The reactor was originally designed to have a limitation on excess reactivity of .6% Δ k/k. This limitation has been changed to 2.3% Δ k/k (Application p. III/6-5). Prompt criticality for this reactor is somewhere between .65% Δ k/k and .74% Δ k/k depending upon which of the four figures for β given by the Applicant variously in the Application and original Hazards Analysis is the correct one (see discussion for point 6 below). Thus it is clear that the current limitation puts the level of excess reactivity far beyond that amount necessary for prompt criticality. In fact, those parts of the original Hazards Analysis that have been put into the SAR in the current Application no longer mention as a safety feature the restriction on excess reactivity as being important to below that needed for prompt criticality. (compare p. III/5-1 of the application with p. 19 of the Hazards Analysis).

As the Hazards Analysis originally said,

> it is possible to operate the reactor with an amount of excess reactivity which is well below that required for prompt criticality. Under these conditions, the reactor meets the safety requirements of a training reactor and can tolerate considerable operational error without damage.
>
> p. 19, Hazards Analysis

The above-mentioned safety feature no longer exists, meaning one less feature to help the reactor "tolerate considerable operational error." As can be seen in the contentions on inadequate management controls and on the facility's history of accidents and unintential scrams, a good deal of operational error must be anticipated. The loss of any protec ion to help tolerate such error is worrisome.

4. The licensed amount of excess reactivity (2.3% Δ k/k) currently permitted is that amount which the 1960 Hazards Analysis found could cause melting of the fuel cladding. The sections of the 1960 Hazards Analysis reproduced in the SAR indicate that at .6% Δ k/k, the level of excess reactivity to which the reactor was initially limited, it was unlikely any substantial damage could be caused if all that excess reactivity was inserted at one time, while at 2.3% Δ k/k one would have a power excursion of 28.4 MW-sec with a corresponding period of 9.1 milliseconds, if the extrapolations from the Borax I tests were correct. That period and energy release are, according to the Hazards Analysis reprinted in the SAR, precisely that amount which is estimated necessary to raise the fuel temperature to the melting point of the aluminum cladding. (Application p. III/A-3,5). The language in the analysis is somewhat contradictory, in that they first say that an energy release of 41 MW sec or a period of 6.7 milliseconds for the Borax--and 28.4 MW-sec and 9.1 milliseconds for the UCLA reactor--would be enough to raise the maximum temperature of the fuel plate to the melting point of aluminum (said in

the Hazards Analysis to be 1000°F over the boiling point of water). Later they imply that both reactors could survive reactivity insertion up to those levels. It seems clear that the Hazards Analysis, which was written to demonstrate that the .6% limitation then in effect was a prudent one, merely was attempting to demonstrate that there was a significant safety margin between the .6% limitation and the 2.3% Δ k/k range where melting could occur. That safety margin no longer exists.

5. The void coefficient for the reactor has changed since the initial calculations were done, putting the reactor as presently licensed over the level necessary for a power excursion that could result in cladding melting and fission product release.

The void coefficient used in the analysis included in the Application (reproduced from the 1960 Hazards Analysis) on pages III/A-1 through A-7 is given therein as -.18 %k/% coolant void; while the current void coefficient, listed on page III/6-5, is - .164%k/% coolant void. Replacing the old void coefficient with the new one in the calculations on page III/A-4--which one must do if one is analyzing the reactor as it now exists rather than as it was in 1960 when the analysis was first done--one finds that the ratio of coolant voids of the Borax reactor to the UC reactor has also changed, altering the entire set of calculations. (One assumes that the term UF is a typographical error derived from attempting to utilize calculations from the University of Florida Argonaut reactor's Hazards Analysis--hopefully, as we shall mention later in this contention, there was no transposition of data as well). The calculations thus would have to be altered thusly in order to bring them into conformity with the 1980 void coefficient:

1960	1980
$\frac{C_{Borax}}{C_{UCLA^*}} = \frac{0.24}{0.18} = 1.33$	$\frac{C_{Borax}}{C_{UCLA}} = \frac{0.24}{0.164} = 1.46$
*(see above note about UF error)	
$\frac{41 \text{ MW sec}}{1.33} = 31 \text{ MW sec}$	$\frac{41 \text{ MW sec}}{1.46} = 28 \text{ MW sec}$
31 MW sec x .82 x 1.12 = 28.4 MW sec	28 MW sec x .82 x 1.12 = 25.7 MW sec
28.4 MW seconds corresponds to a period of 9.1 millisec & 2.3% Δ k/k excess reactivity to bring cladding to the melting pt.	25.7 MW seconds corresponds to a period greater than 10 milliseconds and 2.1% Δ k/k reactivity to bring to melting pt.

(the conversion from MW seconds to % Δ k/k and exponential period is made in both cases from graphs D-5 and D-7 in the old Hazards Analysis).

Thus, if the equations presented in the Hazards Analysis are correct--and the Applicant relies heavily upon them--the 2.3% Δ k/k excess reactivity limitation which, with 1960 characteristics, would have brought them just to the melting point of the cladding, would today be considerably over that melting point. 2.1% would be the corresponding limiting figure today, because of the changed void coefficient. Thus, being licensed for 2.3% Δ k/k puts them considerably over a level that was questionably safe to begin with and creates the clear possibility of a catastrophic reactivity insertion causing cladding failure and a serious release of fission products.

6. By converting 2.3% Δ k/k excess reactivity limitation in the current tech specs into \$3.54 in the proposed tech specs included in the Application--and using a different β than the one used in the Hazards Analysis to make that conversion, it is possible that the Applicant has, without so stating, shifted its tech spec limit from 2.3% to 2.62% Δ k/k, taking it further into the range, indicated by its own Hazards Analysis, capable of causing a serious power excursion and cladding melting.

The Applicant has, in its Application, given three different figures, without clear explanation, for β, while the Hazards Analysis upon which all the calculations are based gives a fourth figure. In converting from 2.3% Δ k/k in the present technical specifications to the $3.54 limitation cited in the ones in the Application, Applicant has used a β of .0065. If any of the other three β's they cite are actually the correct one, this potential error could mean a non-improved <u>increase</u> in excess reactivity from the 2.3% limit up to 2.62% Δ k/k if the Hazards Analysis β of .0074 were used. (The .0074 figure is given on pages D-12,13,14 and 15 of the Hazards Analysis; the two other β's cited are .0068 and ~.0070 on pages III/6-5 and 6-4 of the Application respectively; the β of .0065 apparently used by the Applicant for converting % Δk/k into dollars comes from Application p. III/6-4 and 5.) Since the calculations on safe levels of excress reactivity are based entirely on the 1960 Hazards Analysis, use of other β figures without explanation seems questionable. (For that matter, having four different figures for the same supposed constant floating around without explanation is very worrisome.) If the 1960 Hazards Analysis β is <u>not</u> correct, then it may have thrown off the calculations upon which UCLA relies, because the graphs used to determine exponential period versus excess reactivity inserted use .0074 as β. Either way, explanation is in order and a potentially serious increase in excess reactivity may have been included.

7. <u>The central assumption of the Hazards Analysis, that the Borax I ts can be extrapolated to the UCLA reactor operation, appear to be seriously incorrect.</u>

Borwax was water cooled and moderated. UCLA reactor is water-cooled and partially water-moderated, but also uses graphite as a moderator and reflector. Water has a negative temperature coefficient but graphite appears to have a positive temperature coefficient, throwing off much of the extrapolation of the Borax I data to the UCLA situation.

The Hazards Analysis "estimation of effects of assumed large reactivity additions" begins with the following statement:

> It has been demonstrated repeated in the Borax and SPERT reactors that water-cooled, water-moderated reactors of suitable design may have a very substantial self-protection against the effects of reactivity accidents, even in the absence of corrective action by the reactor control system. This self-protection is provided by the negative steam-void coefficient of reactivity and the negative temperature coefficient of reactivity, both of which can result in important reactivity reductions as the reactor power rises. The UCTR has been designed with a high degree of self-protection of this type. In this appendix estimates are made of the behavior of the reactor under various hypothetical conditions of excess reactivity addition with no corrective action by the control system.
>
> Application p. III/A-1, emphasis added

Although there is indeed evidence, as indicated above, that water-cooled, water-moderated reactors have substantial self-protection mechanism, primarily negative reactivity coefficients, the UCLA reactor is not the same as the Borax and SPERT reactors in that they are exclusively water-moderated and the UCLA reactor is moderated by both water and graphite.

8. Positive temperature coefficient of graphite. Eight years after the Hazards Analysis was written, UCLA was notified by the AEC that the University of Washington Argonaut reactor, similar in design to UCLA's, had discovered a positive temperature coefficient for graphite of

+0.012%/°F. The AEC inspector at the time of informing them of the University of Washington finding inquired of UCLA if they had noted the same thing. UCLA informed the inspector that they had tried an experiment to test it, but the experiment had failed. The inspector made a rough calculation on the spot based on log entries and confirmed a positive graphite temperature coefficient:

> By reference to the console logbook data concerned with core reactivity changes as a function of time and the temperature of the water moderator, it appears that a positive temperature graphite temperature of 0.006% delta k/k/°F exists.
>
> p. 6, inspection report 50-142/68-1

UCLA committed itself to experimentally determining the graphite temperature coefficient "as soon as promising test equipment could be developed." But not long after that Dr. Smith, the lab director who had made the commitment to the AEC, went on leave, and not long thereafter a new Director was apointed. There is no evidence in any of the documents presently available to the Petitioner that would indicate whether that experimental determination was ever made.

A positive temperature coefficient for the graphite--particularly one that is larger than the negative coefficient for the water (+.006% compared to -.0048% $\Delta k/k/°F$)--raises extremely serious questions about whether the principal self-limiting design safety feature, that of a negative temperature coefficient, exists forthis reactor. It also makes very questionable whether any of the data from Borax can be used because it was an entirely water-moderated reactor with a clearly negative temperature coefficients. Questions also are raised about the comparability of the void coefficients when the graphite is taken into account. Even the Applicant recognized the analytical problems introduced by the presence of a graphite moderator, although it didn't address the problems directly, apparently thinking that the graphite like the water had a negative coefficient* and could thus be ignored. But the uncertainties are clear:

> The relative importance of the two moderators, graphite and water, in determining the effective neutron temperature introduce uncertainties in the theoretical computation of this coefficient.
>
> Application, III/A-2, emphasis added

9. Applicant's analysis relies on twenty-five-year-old data and fails to include any new data, adding more uncertainties.

A major part of the Applicant's SAR is a copy of a section of the Hazards Analysis written twenty years ago for the initial reactor license. The Hazards Analysis lists as its only references twenty-five year old reports done on the Borax I experiments in the early fifties. (The Borax I was a reactor designed to test the effects of rapid reactivity insertion; it self-destructed in the late summer of 1954 with a 135 MW-sec release of energy and a steam explosion accompanied by release of fission products. For details, see Thompson and Beckerley, The Technology of Nuclear Reactor Safety, p. 622).

The SAR and current Technical Specifications included in the Application all mention the SPERT tests as providing evidence of the self-limiting features of the UCLA reactor. However no data from the SPERT tests are cited or utilized in the SAR, presumably because the bulk of the tests were completed after the Hazards Analysis upon which the SAR relies so heavily was completed.

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*For confirmation of a positive coefficient for graphite, see Thompson and Beckerley's description of the power excursion and related partial meltdown of the graphite-moderated, sodium-cooled SRE (p. 643); euctectic melting--unalyzed in Applicant's SAR--was a significant factor for the SRE melt; see photo of rods attached to back of this contention.

A great deal of knowledge has been gained in the last twenty-five years concerning the behavior of reactors and fuel during power excursions and cladding failures. The SL-1, SRE, SNAP-8, SPERT, S8ER, OMRE, and TRIGA reactors have all valuable experience to aid in analysis. (For example, the TRIGA reactor, another type of training reactor, has been shown to be capable of a cladding failure with a $2.00 insertion of excess reactivity). But the Applicant has considered no new data and continues to rely exclusively on the 1953 and 1954 Borax I tests. Attached to the end of this contention are two graphs, one from the Applicant's Hazards Analysis, relying on twenty-five-year-old data, and another one, from Thompson and Beckerley, relying on data that is only fifteen to twenty years old. One can easily see that the few extra years of experience with reactor safety has provided much more data; certainly a comprehensive review of even more current data is called for in making an analysis of this gravity.

By failing to update their Hazards Analysis, even to the point of simply xeroxing the section on excess reactivity and including it untouched in their current Application, Applicant has failed to make even a minimal effort to demonstrate that the reactor will not endanger the public health and safety.

10. Applicant's Hazards Analysis regarding excess reactivity is based on numerous unverified assumptions, many of which are not identified by Applicant as such, and cannot be used as the basis for anything more than estimating a range of excess reactivity additions at which hazard might exist. Furthermore, Applicant does not give the error bars for its computations and analyses, error bars that must be assumed to be very large.

a. The entire section of the Hazards Analysis reproduced in the SAR is filled with terms describing the calculations clearly as estimates and extrapolations:

> On the assumption that this minimum value is the true value, a rise of water temperature from near 0°C to 80°C would reduce reactivity by 0.6% k_{eff}.
>
> III/A-2 emphasis added

> The characteristics of the UCTR which determine its behavior during power transients resulting from large reactivity additions are quite similar to, but not identical with, those of the Borax I reactor.
>
> III/A-1 emphasis added

> Experiments of the Borax and SPERT types have not been made with reactors having widely different neutron lifetimes. The general evidence of the experiments, however, supports the supposition that ...
>
> III/A-3 emphasis added

> In comparing the behavior of different fuel plates, it must be recognized that the total energy release of the power excursion can no longer be considered as a definitive variable...
>
> III/A-4 emphasis added

The text is replete with phrases about estimation, assumption, uncertainties, suppositions, and so on. The Hazards Analysis was esigned to merely roughly estimate the upper limit of the safety margin--not to say exactly where danger will lie. That it cannot do.

b. The figure of 2.3% $\Delta k/k$ being the lower bounds of the danger zone was extrapolated from Borax I data and entailed a considerable number of assumptions, the accuracy of which are open to significant question. The Hazards Analysis itself makes clear that the figure 2.3% is merely a rough estimation in order to determine how large a safety margin the reactor would have at the then-licensed limit of .6% $\Delta k/k$. This is made clear when in the Hazards Analysis, after analyzing what an insertion of the then-limit of .6% would do, it goes on to say:

> It is useful to estimate the value of excess reactivity which, if suddenly inserted and not removed by the control system, would raise the maximum temperature in the hottest fuel plate to the melting point...
>
> The first step in the procedure is the estimation of the exponential period corresponding to the excess reactivity which would have characterized a power excursion of similar effect in Borax I.
>
> III/A-3 emphasis added

The Hazards Analysis cannot now be used to declare that 2.3% Δ k/k is safe. It merely shows that .6% Δ k/k is safe and has a reasonable safety margin to compensate for the potential errors in extrapolating from the Borax data.

c. The SAR uses as a "constant" an interpolation off a line drawn imposed on 21 data points from the Borax I experiment. (see chart marked Figure D-5 at the end of this contention). The line itself is a rough approximation on a log-log chart with the line only capturing 5-7 points plotted, with no data points located anywhere in the range of the point of interpolation. There is obviously a significant probability of error involved here, particularly on a log-log chart like this, but no error bars are given, in the absence of which, a significant extra safety margin must be made.

The SAR makes a similar assumption of a "constant" on p. III/A-3 by assuming

> that the maximum fuel-plate temperature rise is, to within experimental error, proportional to the maximum energy release of the power excursion. The proportionality was determined to be constant 24.4°F per MW-sec." (emphasis added).

Without defining the bounds of that possible experimental error, that "constant" is used to determine at what excess reactivity the UCLA reactor would suffer a cladding melt, and then to justify licensing it at <u>exactly</u> that level.

Obviously, such interpolation off rough data points on a log-log chart, and such attempts at creating a "constant" from a few data points in a 25-year-old experiment, are subject to a high degree of probably error without even taking into account the other assumptions involved in applying the data to the UCLA reactor, yet the Applicant does not acknowledge these error factors or give statistical error bars. At least Applicant should have built in very large margins of safety.

d. There are indications that the Hazard Analysis sections included in the SAR dealing with excess reactivity additions were prepared by using Hazards Analyses for other Argonaut facilities. At one point, where the initials UCTR (University of California Training Reactor) should have been given in an equation, the initials UF are inserted. (p. III/A-4). And the confusion about the different β's may be in part due to the use of graphs in UCLA's Hazards Analysis from another facility where there was that β. The UF mentioned above can likely mean the University of Flordia, where another Argonaut-type reactor is located; it is thus at least possible that the author of this Hazards Analysis was working from the University of Flordia analysis, which is cited elsewhere, and following computation done for the University of Florida reactor, transposed their initials into the equation. The question is thus raised whether any figures or non-transferrable graphs were also transposed. (This question is further underlined by the fact that the charts cited in the HA have different page #'s than the citations would indicate.)

11. New mechanism for rapid reactivity insertion. Since the analysis included in the Application was written, 20 years ago, a significant new mechanism for the rapid insertion of excess reactivity has been added to the facility--a pneumatic "rabbit" system. This system provides a new mechanism for the rapid insertion of a sample of positive worth as well as for the rapid removal of a sample of negative worth, either of which could initiate or contribute to a serious excursion. In addition, core characteristics key to the calculations included in the Hazards Analysis may have been altered through the core modifications necessary for the installation of the rabbit system.

A portion of the Hazards Analysis not included in the current Application recognizes sample removal as a potential cause of a power excursion:

> One procedure to achieve maximum excess reactivity in the reactor would be to insert into the reactor a sample with sufficient absorption to prevent start-up. When the controls were fully withdrawn and criticality was not achieved, the maximum reactivity would be added if the sample were removed without reinserting the control blades.
>
> p. 60

12. The licensed limit on combined experiments--\$3.54, negative or positive--creates an unacceptable method by which such a catastrophic accident could occur. Experiments worth +\$3.54, improperly inserted, could double an already excessive excess reactivity installed in the reactor. Rapid insertion of a negative worth experiment could also have a catastrophic result.

13. The Hazards Analysis indicates that the removal of one of the beam tubes could insert excess reactivity into the reactor by removing neutron absorption and increasing reflector savings. With the reactor apparently being right at or over the point at which melting could occur

with the reactivity presently permitted, and with the uncertain accuracy of the calculations by which that point was determined, beam tube removals--singly or severally--could contribute to an unacceptable excursion.

14. The reactor power has been increased since the original Hazards Analysis was written; there is no adequate review contained in the analysis as to how the increased power may alter the excess reactivity calculations from 20 years ago and one-tenth the power.

15 . On at least two occasions Applicant has violated excess reactivity limits, suggesting that even if the licensed limit were safe, it would not prevent possible excursions at this facility.

Notice of Violation, dated August 15, 1969:

> Contrary to Amendment 2 of the license, which incorporates the application dated March 21, 1961, the reactor was operated with a core excess reactivity greater than 0.6% delta k/k during the conduct of experiments designed to measure the effect of water level on reactivity. We understand that on February 5, 1969, and March 4, 1969, the core excess reactivity was approximately 1.5% delta k/k.

In addition, the Applicatin lists the 1960 limit as 0.6% (at 32 °F) and the amount installed then as 1.5% (at room temperature); even taking into account the negative temperature coefficient of water--and not compensating for the apparent positive coefficient of graphite--that 1.5% amount installed would appear to be in excess of the then-licensed limit. (see III/6-5). It certainly at least merits some explaining in the Application.

Furthermore, the current technical specifications and the proposed ones in the application make no reference to the temperature at which the reactor is currently limited to 2.3% delta k/k.

And to make matters worse, inspector A.D. Johnson during inspection No. 50-142/71-1 found an error in the technical specifications concerning the excess reactivity limit. The limit was off by a decimal point--an order of magnitude. Fortunately, the error was on the safe side, but next time fortune may not be so kind. And inexplicably, once corrected, the error reappeared in the Technical Specifications. An error of a decimal point in the other direction and the failure of someone to catch it could contribute to a disaster.

16. The Borax data itself needs error bars. Thompson and Beckerly p. 623 indicate that "the somewhat unexpected destructiveness of the test resulted in losing some information which might have been gained. They continue: "Instrumentation and other means for obtaining information from transient tests should be planned on the basis of overestimates of the possible destructiveness of the tests if maximum information is to be gained." They report the period as .0026 seconds, describing it as "the minimum period measured," so the few data points that are charted for Borax in the Hazards Analysis may not be as firm as one would like. It is clear from the H.A. chart that there are no data points in the region of interest, that all that is done is extrapolation.

17. Failure to analyze potential for euctectic melting. Other serious reactor accidents (e.g. SRE) have had as partial causation a melting caused by creation of a fuel-cladding alloy at a certain elevated temperature, that new alloy having a lower melting point than either the fuel or cladding alone. Analysis of the potential for a euctectic melt is lacking from the SAR.

18. <u>Excess reactivity hazard exacerbated by numerous related safety and operation problems</u>.

a. Applicant has a history of inaccurately calibrating its instruments (see contention on inadequate maintenance and instrument calibration), raising serious questions about their ability to know the actual worth of an experiment, set their trip points, make sure that reactor instability is properly corrected for, and avoid hazards that could be caused by inaccurate readings for neutron flux, power, temperature, etc.

b. Applicant's history of occurences causing unscheduled shutdowns raises questions about the ability to guarantee that incorrect procedures will never be involved in something like unsafe withdrawal of beam tubes.

c. Applicant's problems with the pneumatic tube system (leaks, need to replace tube itself, "archaic counting room") could result in a large reactivity insertion.

d. Applicant's history of lax administrative and managerial controls such as inviting non-licensed operators to run the controls mandates that the reactor have nowhere near the amount of excess reactivity permitted to cause a damaging power excursion.

e. Applicant's history of by-passing interlocks and safety systems raises an unacceptable probability that such an accident could occur through such a by-passing.

f. Applicant's troubles with control blades (pinning, failure of drive logic, lack of replacement motors) creates an unacceptable likelihood that the 10 CFR 50 Appendix A III guidelines cannot be met by this facility with regards redundancy and capability of reactivity control system.

g. Positive temperature coefficient for graphite moderator raises serious concerns that should an excursion take place, normal self-limiting features once thought inherent in this reactor will not be available.

h. Lack of air-tight containment structure and siting in a crowded building on a crowded campus make the reliance on the cladding as the "principal barrier"to fission product release (Application, V/1-4) worrisome and call into question Applicant's ability to demonstrate protection by multiple fission product barriers.

i. There are only four control blades and there are no back-up blades. The Commission has expressed concern about blade drive systems and lack of back-up motors. The drive logic in the past has malfunctioned, blades have repeatedly become stuck. The worth of the blades is $1.80 for one and $2.40 to $2.70 for three. Anthony Nero, Jr., says in A Guidebook to Nuclear Reactors (UC Press, 1979, p. 263):

> Individual control rods are often "worth" slightly less than one dollar, indicating that a single control rod cannot be responsible for a catastrophic reactivity insertion."

j. The problem with the heat balance and long-term stabilization of neutron channels and apparent lack of heat balance-nuclear instrumentation calibration as required by the Technical Specifications (see contention on calibration) raise serious questions that the automatic scram systems may not be able to shut down when power exceeded the trip point because of inadequate calibration of those trip points. Facility has had trouble with this in the past to a small degree; a larger calibration failure on the trips could result in failure of a back-up system when there are few others. (see 19[illegible] annual report, p.2)

k. Graphite swelling and cracking--a problem with numerous other reactors that use graphite (Hallam and Piqua as examples) has not been examined for this reactor, as well as the possible effects of soaking the graphite by steam or water. Graphite swelling could make insertion of control blades difficult; graphite soaking could change reactivity coefficients.

l. Fuel blade warping has not been examined in the Application, despite repeated problems with tie bolt failures in the past (see inspection reports for 1968).

m. The apparent lack of a deflector changes many of the assertions made in the Hazards Analysis about protection against repeated excursions, if indeed the deflector has been removed as it appears.

CONCLUSION

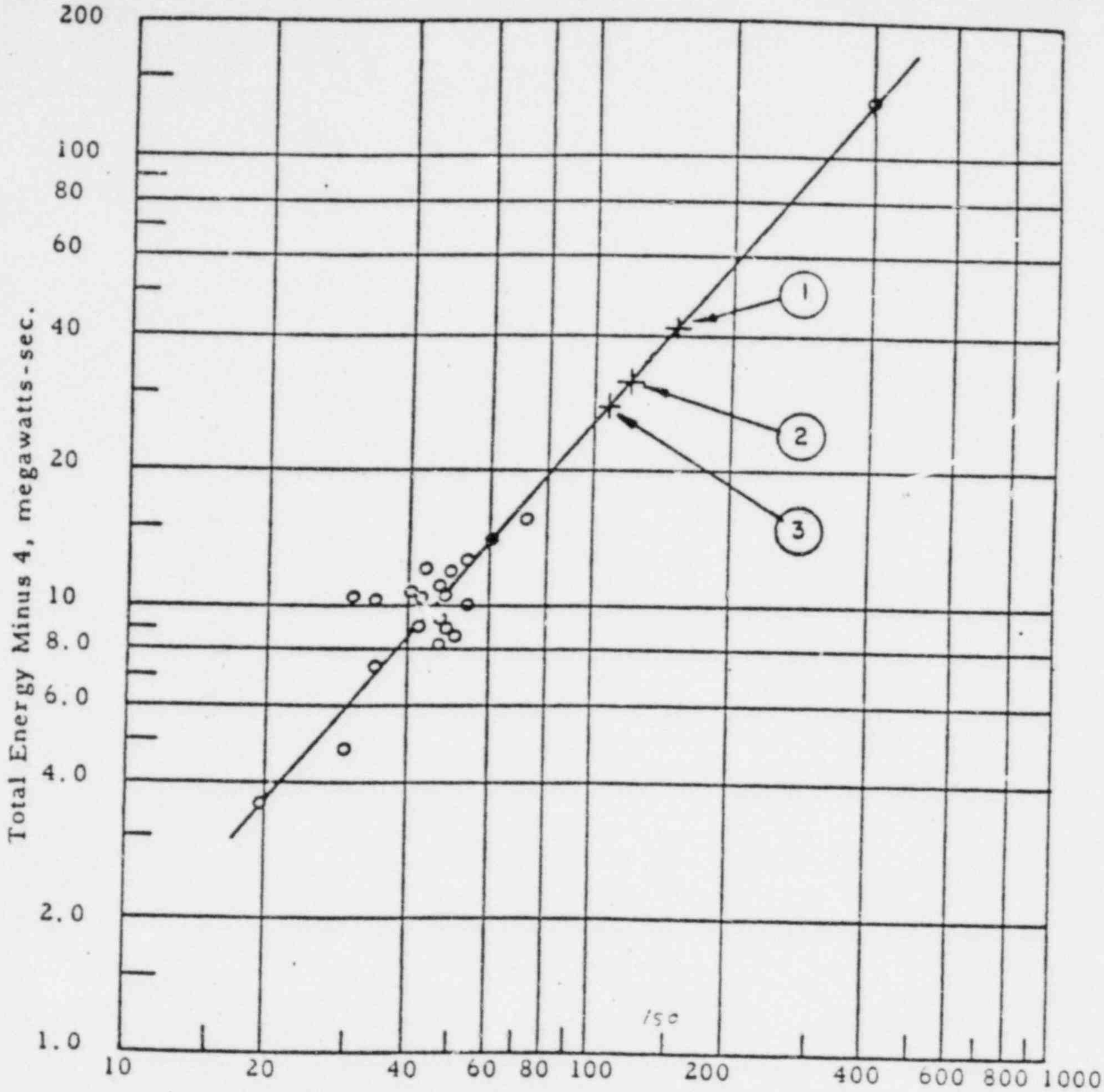
The plethora of safety problems and practices which impinge on and interrelate with the excess reactivity characteristics of the reactor again emphasize the need at this facility for a very large margin of safety to be built into the excess reactivity limitations, as in fact the designers of this facility had intended. The gradual removal, one by one, of those safety features raise serious safety concerns.

The twenty-year-old calculations, the positive temperature coefficient of the graphite moderator, the minimization of other self-limiting features, and the number of ways in which the excess reactivity of the reactor could be affected lead to only one possible conclusion, that the Applicant cannot give reasonable assurances that the reactor will not endanger the public health and safety.

There are few areas of the reactor operation that are more critical for safety considerations than reactivity control and cautious and prudent limitations on the amount of excess reactivity that can ever be present. Given the gravity of this matter, Applicant has a heavy burden of proof to demonstrate that the current limitations on excess reactivity are sufficient to adequately protect public health and safety. Virginia Electric and Power Co.; ALAB-256, 1 NRC 10, 17 at n. 18 (1975). It should go without saying that Applicant cannot meet such a heavy burden by relying on an analysis based on dated references, questionable assumptions and comparisons, and failure to take into account changed characteristics. Consequently, the Application as it stands cannot support the issuance of the requested license.

It appears from all the material in the above contention that this facility may very well have the potential of a catastrophic excursion caused by rapid insertion of too much excess reactivity, causing a cladding melt and significant fission product release. The facility appears to be considerably over the safe level of excess reactivity; it has the means to insert it; and it has an operating history that indicates an extraordinarily unacceptable likelihood that such an error could occur. Page 60 of the old Hazards Analysis, not included in the SAR, indicates that of the two methods by which they thought a reactivity accident could be initiated, both would "require the . . . violation of the operating rules by the operator." If protection from a catastrophic reactivity accident rests on the assumption of reactor operator compliance with procedures, with this facility's history of problems, a threat to public health and safety of considerable proportions exists.

While it is unlikely that a reactivity insertion could bring the fuel to the temperature of the melting point of the uranium, Applicant's own analysis indicates an unacceptable likelihood that such a temperature for the melting point of cladding can be reached with the excess reactivity presently permitted. The result would be the same, in essence, from a public safety point of view; the primary reason to worry about fuel melting is fear of breaching of the containment. Since this facility has no containment structure, a breach of the cladding would be sufficient to create unacceptable exposures. (for details about likely exposures in case of such an accident, see contention about 10 CFR 100).



RECIPROCAL OF REACTOR PERIOD, SEC.$^{-1}$
INITIAL WATER TEMPERATURE 66°F TO 82°F

1. Estimated safe limit for Borax I.
2. Estimated safe limit for Borax I with Educator Reactor plate spacing.
3. Estimated safe limit for Educator Reactor.

ENERGY OF EXCURSION

FIGURE D-5

Total Energy of Excursion Minus Energy Required (4 mw-sec) to Raise Temperature of Center of Average Plate to Boiling Point.
(from Fig. 41 AECD-3668, Appendix F. Ref. F-3)

from 1960 HAZARDS ANALYSIS

A#

23

E-1	E-2
2.4	2.4
S,V	S,V
2.3	1.4
125	125
1.2	2.7
2000	2000
1.8	1.0
7.6	2.9
64	50
39.1	39.4
130	245

s being investi-

...rved to demon-
...l excursion was
... shown that the
...to have been a
...n, boiling, and
...en some insight
Last, but not
...ragement along
is possible now
...ransients in at

... SL-1 accident
...nual withdrawal
...e reactor. This
transient whose
...n in Table 3-9

...as estimated in
...e withdrawal of
reactor critical
...n calculate that
...n continuing the
... (the position in
...d were collapsed
...lieve that power
...imately 4 msec
...ation terminated
...3 + 0.4 × 10⁴ Mw.
...mperature in the
had just reached
...060°C (3767°F).
...in. or 0.889 mm)
...ter surfaces had
From the start
...he excursion, 5%

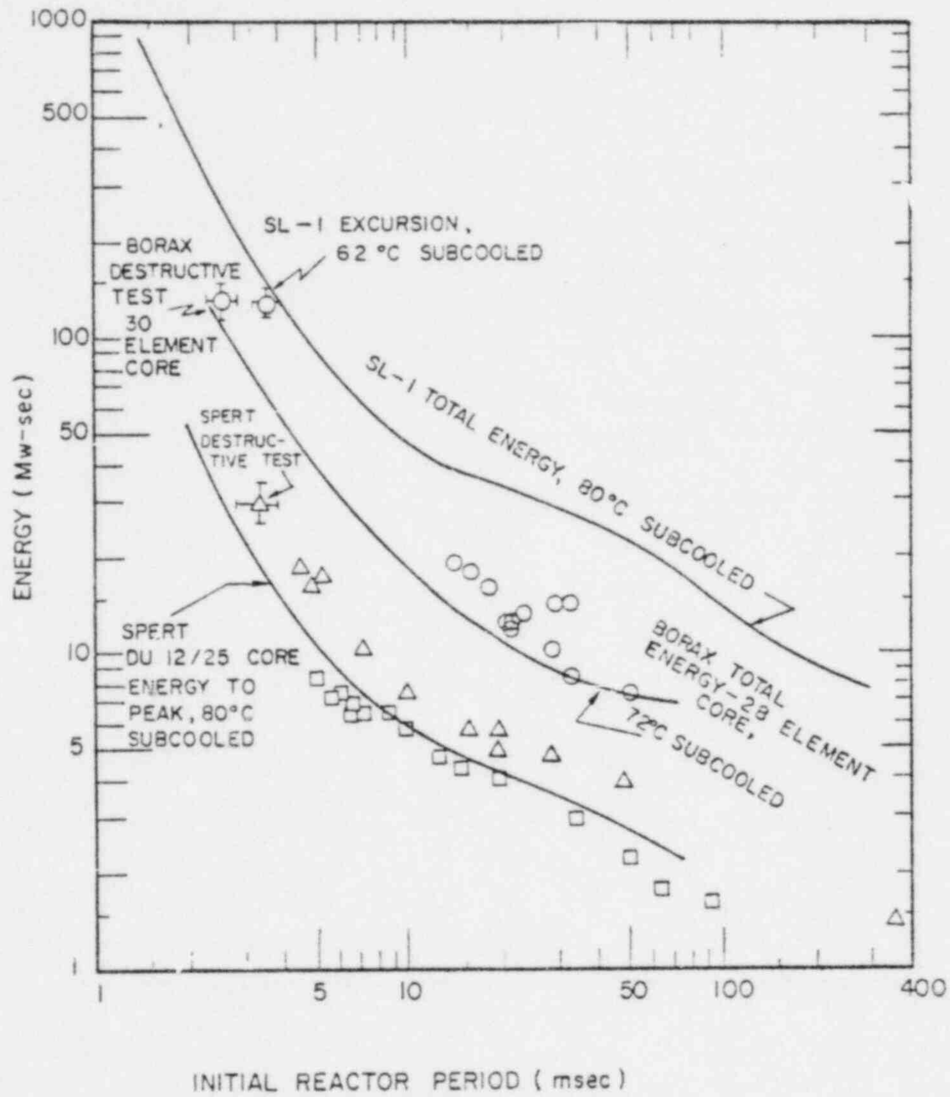


FIG. 3-30 Predicted and measured nuclear energy release vs. period for BORAX-I, SPERT-I, and SL-1. Total energy unless otherwise specified. Circles are BORAX data from reference [19], squares SPERT-I DU 12/25 data from [65a] and triangles SPERT-I destructive test data from [65].

a single slug. The water level in the tank was about 2.5 ft (76.2 cm) below the top of the vessel and the slug, therefore, had this distance to acquire kinetic energy. This slug hit the bottom of the of the plate area in the central 16 elements reached the vaporization temperature and this caused more steam production and violent destruction of this region. About 20% of the entire core shows melting proceeding to the clad surfaces. General Electric estimates that the total nuclear transient energy was 133 ± 10 Mw-sec and that no more than an additional 33 Mw-sec of energy (best estimate 24 ± 10 Mw-sec) was released in chemical reactions between the molten or vaporized metal and water.

The formation of the steam void terminated the nuclear transient, but it also created a high pressure region. The pressure wave front which developed no doubt spread out in all directions, striking the vessel side walls next to the core first and bulging them, then striking the bottom head and giving a net downward force on the vessel,* and finally accelerating upwards the entire mass of water above the core. It appears likely that the water moved upwards more or less as

*Apparently no one has looked into this downward force and one can only conjecture as to whether this downward force was sufficient to sever the pipe connections to the tank. It is difficult to judge the resistance to such a shock provided by the vessel supports.

Technology of Reactor Safety Thompson + Beckerly 1964

Figure IV-A-6. Bottom of Damaged Element in Channel 55

Figure IV-A-7. Midsection of Damaged Element in Channel 55

SRE Fuel after excursion

11/30/59 Source: SRE Fuel Element Damage Interim Report
Atomics Int'l. NAA-SR-4488

VI. EXCESSIVE RADIATION; VIOLATION OF RADIATION STANDARDS; INADEQUATE MONITORING

Applicant has in the past and is at present emitting excessive radiation and violating radiation standards and conducting inadequate radiation monitoring. Applicant has failed to demonstrate in Application or recent performance any evidence that these conditions can reasonably be expected to improve in the future, in the absence of which demonstration a granting of an operating and SNM license cannot be made without undue threat to public health and safety.

Specifically,

1. Past and present emissions excessive.

The detailed basis for this contention is contained in document submitted as part of initial Petition for Leave to Intervene. That document, "The UCLA Nuclear Reactor: Is It Safe?" gives in considerable specificity bases for contention that both past and present emissions have been and are excessive. A brief summary follows:

a. In a January 1975 Inspection Report, No. 50-142/75-01, page marked "summary", the inspector noted several violations of the technical specifications and 10 CFR 20:

1. The exhaust stack was found to be 17 feet short.
2. The ventilation exhaust from the reactor room was not being diluted to the required 14,000cfm rate.
3. The radioactive gaseous effluent monitor had not been calibrated with the required frequency.
4. An error of a factor of ten in the calibration curve for the gaseous effluent monitor had been identified.

5. Extensive construction of new facilities around the reactor had resulted in a condition which could conceivably have personnel immersed in the discharge plume from the ventilation exhaust stack.

b. The error factor in the effluent monitor was later found to be a factor of 300 instead of 10. (see letter from Charles Ashbaugh III, Reactor Supervisor, to David Jaffee, USNRC, dated April 23, 1975, correcting past calculations of Argon-41 releases).

c. In a 1974 Inspection report (no. 50-142/74-01, UCLA was cited for not having an accelerator nozzle on the exhaust stack as required.

d. In April of 1975 the NRC responded to UCLA's efforts to rectify some of the problems above. The NRC found their response "an unacceptable response" in part because

> the revised calibration figure on the gaseous effluent monitor had revealed that annual average discharge concentrations were above limits permitted by the Technical Specifications (essentially 10 CFR 20 limits).
>
> NRC Memo: Enforcement Conference and Subsequent Actions, UCLA, Docket 50-142, April 22, 1975.

Thus, UCLA had been determined by the Commission's Inspection and Enforcement division to be "above limits permitted by the Technical Specifications (essentially 10 CFR 20 limits" in part because of all the other inadequacies--stack too short, no accelerator nozzle, not enough flow rate, placement of new structures around reactor stack, and so on. That finding of noncompliance with both tech specs and 10CFR20 limits, due in large measure to significant underestimation of radioactivity releases, makes clear that the violation had gone on for many years previous because it was only in 1975 that the error in calibration was detected, despite the fact that correspondence of concern between the Commission and the Applicant goes back into the early sixties on the question of calibration of the Argon monitors.

2. Future emissions

Several of the underlying conditions that caused the emission to exceed the Technical Specifications before they were amended have not been changed and therefore there is reason to believe that persons will continue to be exposed to such excessive emissions.

a. The reactor stack nozzle has been removed from the stack.

b. The height of the stack has never been increased.

c. The overall emissions of the reactor have been increasing over the last few years and will continue to increase if reactor use is increased.

Releases of radioactive Argon gas have increased from 33 curies in 1976 to doubtle that amount, 65.6 curies, in 1979. (p. II/2-5). Thus, the only demonstration made by the Applicant about future intentions is the increase in emissions. Promises of installation of decay tanks are more than offset by Applicant's linking of said tanks to increased reactor use factor and/or power. The only evidence presented about future emissions is that they are likely to be more endangering to public health and safety than they are now. Especially if the placement of Math Science airvent remains where it is, directly downwind of the reactor stack.

3. Failure to Adequately Monitor

Applicant has not in the past, nor has it in the present Application, been able to reasonably demonstrate that exposure in unrestricted areas are not excessive. The radiation monitoring system, devices and programs are wholly inadequate.

a. Applicant has never directly measured the Argon anywhere except at the stack, where its concentration at 100 kw is variously reported as between 1 and 2 x 10^{-5} μCi/ml of air, 50 times MPC even when the reactor utilization factor (18.8%) is figured in. No measurements of Argon have every been taken elsewhere.

b. Applicant has had repeated difficulties calibrating their monitoring equipment, leading to past errors in emissions calculations of 300 fold.

c. In preparing his study on "The Atmospheric Dispersion of Argon-41 from the UCLA Nuclear Reactor," Mark Rubin found that the required systems for measuring Argon directly "were not available at UCLA... and finances seemed to preclude the development of the required radioactive decay system." (p.4) Rubin then chose to simulate Argon dispersion with a tracer gas, sampled with 35cc syringes. (p.9) The sampling technique produced almost 10-fold variations in single location samples. These wide variations were caused by the lack of adequate sampling equipment (Rubin, p.24). However, Rubin utilized these results obtained through faulty sampling methods in reaching his conclusions that exposures with within the limits of 10 CFR 20, although the greatest likely public exposures were seen to be within the Math Sciences building, where only a few of the SF_6 samples were taken.

d. Contradictory data. A TLD study done by the Applicant produced results that they admitted were "not free of ambiguous interpretation," (1978 annual report, p.24) even after rejecting the high readings, something they did without testing the supposition that led them to do it, that the TLDs were picking up radiation from the concrete. They lost a few TLDs to birds and "curious individuals," threw out the remaining high readings, and were left primarily with TLDs upwind of the stack. Readings on the stack were similar to readings 100 feet away, despite the assumption that dilution would be at work. One TLD was moved from near the stack to directly on top of it: if anything, its reading went down!

e. The film badge data reported in the application contradict even further the TLD data. Page II/2-1a of the Application indicates that badge x^i located in the reactor stack (at the same position as the TLD NEL reports as averaging 43.2 mrem/year gamma + estimated 10 mrem/year beta, according to Tom Collins, Assistant Dean of Engineering, in the Daily Bruin 11/16/79) reports a reading of 350 millirem/year beta only. When one adds in the gamma radiation at a rate of four times beta, based on Dean Collins' estimate cited above, the resultant exposure is 1750 mrem/ year. The figure is over 25 times the level the TLD was reading at the same location.

The above basis indicates that the studies conducted by the Applicant have either suffered from such serious methodological flaws or demonstrated such inconsistent results with each other that the reliability of all of the studies are called into question. Given the lack of reliable empirical data it is impossible for Applicant to assure that the concentrations of Argon-41 or other radioactive substances being released from the reactor are not reaching the public in quantities inimical to their health. One last example makes that very clear. Applicant (p. II/2-1) states that measured levels of direct radiation in uncontrolled areas near the reactor "are not detectable above background ($\sim 0.04 \pm 0.03$ mrem/hour)." That sounds like a very reassuring statement until one realizes that 0.04 mrem/hour is 350 mrem/year, and that background in Los Angeles is 80-100 mrem/year. So Applicant

can't detect radiation above background because they define background as about four times what it is, can't measure below that level, and even at it have a probability of error of 75%. Thus, it is possible that radiation levels in unrestricted public areas could be as high as 612 mrem/year and the detector could read zero (350+75%).
It is clear that Applicant is incapable of adequately demonstrating emissions are not excessive and comply with federal radiation standards and their own technical specifications. The film badges that Applicant has placed in various locations in Boelter and elsewhere have threshholds such that the levels of radiation likely to be found within those buildings, unnecessarily hazardous though they may be, would not approach those threshholds, and the readings would be zero, nothing over background, even though there might be a sizeable exposure taking place. (see sensitivities of film badges in memo by Jack Hornor, November , 1979, on film badge locations).

4. Failure to meet radiation standards

a. 10 CFR 20 (appendix B & 20.106.b and 20.106b(1) and (2)

1. NRC Memo: Enforcement Conference and Subsequent Actions, Docket 50-142, April 22, 1975 stated:

> the revised calibration figure on the gaseous effluent monitor had revealed that annual average discharge concentrations were above limits permitted by the Technical Specifications (essentially 10 CFR 20 limits).

It would appear that this finding of violation of 10 CFR 20 limits would indicate that the Applicant had been in violation of those regulations for years, because the calibration error was a long-standing one.

2. 20.106(b) states that an application for a license or amendment may include proposed limits higher than those specified in Appendix B of Part 20 and that the Commission will approve the proposed limits if the applicant demonstrates

> (1) That the applicant has made a reasonable effort to minimize the radioactivity contained in effluents to unrestricted areas; and
>
> (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 specified in Appendix "B" of this part.
>
> (c) An application for higher limits pursuant to paragraph (b) of this section shall include information demonstrating that the applicant has made a reasonable effort to minimize the radioactivity discharged in effluents to unrestricted areas. . . .

It is therefore contended that UCLA's Application for a license includes proposed limits higher than those specified in Appendix B of Part 20, that Applicant has failed to include information "demonstrating that the applicant has made a reasonable effort to minimize the radioactivity discharged in effluents to unrestricted areas," and that Applicant has not adequately demonstrated, nor can it with the inadequate monitoring and simulation tests done to date, that no individual in an unrestricted area will be exposed to excessive levels of radioactive material discharged in Applicant's effluent, and that therefore, Applicant's request for license must be turned down because concentrations of Argon-41 in Applicant's effluent are higher now than when the Commission cited them in1975 for violating 10 CFR 20 limits and Applicant has failed to provide the information required and to make adequate showing (of reasonable efforts to minimize radioactive releases and of demonstrable unlikelihood that a person in an unrestricted area could be exposed to excessive emissions from the facility) to qualify for Commission ruling permitting discharges higher than 10 CFR 20 Appendix B concentration limits.

b. <u>10 CFR 50.36a--ALARA Requirement of Technical Specifications</u>

1) Applicant was cited in 1975 for violation of Technical Specifications limits on emissions, for a situation that was, when discovered in 1975, one that had existed for a great many years previous. Thus there was long-term violation of the Technical Specifications emissions limits that paralleled the violation of 10 CFR 20 limits; since ALARA limiting values are to be small fractions of 10 CFR 20 limits, it is clear that in 1975 and for a great many years previous (while Applicant was underestimating Argon releases by a factor of 300) Applicant was in violation of ALARA as well. It is important to note that the concentration of emissions in stack effluent has not gone down since 1975--annual releases have tripled since then (II/2-5), thus there is reasonable basis to assume that ALARA remains unmet. The reasonable efforts to reduce concentrations of effluents in unrestricted areas--raising the stack, increasing the flowrate, restricting the roof or adequately posting it, moving ventilator intake or stack itself, putting accelerator nozzle back on--

are all undone. The principle of ALARA--quite literally taking every action that can reasonably be taken to keep emissions as low as reasonably achievable--clearly is not followed by Applicant. There are a host of reasonable efforts Applicant could have made and still could make to keep emissions as low as reasonably achievable, yet Applicant has made none of them.

The recommended way of showing compliance with 10 CFR 50 radiation standards (limiting conditions for operations and criteria for licenses) is through Appendix I to CFR 50. Reg. Guide 1.109 is here very useful in determining numerical guidelines for Appendix I. Applicant has made no effort to show that it meets the guidelines of Appendix I or the numerical guides in 1.109 Reg Guide, nor has it proposed any other way in which to measure its performance with regards the ALARA standard.. If one takes the limited amount of data, flawed though it is, that is available from Applicant regarding possible radiation levels in unrestricted areas, it is clear that ALARA as normally defined is being violated. The SF_6 study, for example, indicated likely exposures inside the Math Science Building to be roughly 12% of MPC, which would be several times ALARA. The TLD and film badge results similarly show exposures in excess of the 5 mrem whole body 10 CFR 50 Appendix I criteria. If a big power plant must adequately demonstrate that they will meet those design criteria before being licensed, and in the absence of any proposal by Applicant for alternate criteria, it seems most reasonable to assess their license by the same criteria. And according to those criteria, Applicant has failed to meet them and the Application for license should be turned down.

c. Failure to demonstrate meeting of the 40 CFR 190 standards that members of the public will not be exposed to 25 mrems whole body or 75 mrems thyroid by the planned discharge of the reactor. The Rubin data, the TLD and film badge data, and the concentration figures of the Argon monitor all indicate the 40 CFR 190 standards are not being met.

. d. <u>10 CFR 100 criteria</u>. This is discussed in a separate contention regarding 10 CFR 100. Suffice it to say here that Applicant's own Hazards Analysis indicates that thyroid doses in case of an accident could be 1800 rem to members of the public, considerably over the 10 CFR 100 limit of 300 rem thyroid dose.

CONCLUSION: Applicant has for long periods violated 10CFR20 requirements and the requirements of its own Technical Specifications. Applicant has clearly demonstrated that it cannot meet the 10CFR50.34a and .36a and Appendix I guidelines for a showing of adequate meeting of ALARA; likewise it has clearly demonstrated it does not meet the siting criteria of 10 CFR 100 to ensure that radiation exposures in case of serious accident are kept below the 10 CFR 100 levels. Failure to meet the 10 CFR 50 and 100 licensing criteria mandate rejection of the Application; history of violation of 10 CFR 20 and the Applicant's own Technical Specifications over long periods of time indicate a serious safety threat would be posed if the license were granted; and failure of Applicant to make showing of compliance in the future with the above standards and to show significant improvement in its monitoring and emissions control systems make it a public health and safety threat for such a license to be granted absent serious showing of changed practices.

VII. LACK OF OPERATIONAL RELIABILITY

PERSISTENT PATTERN OF UNSCHEDULED SHUTDOWNS, ABNORMAL OCCURRENCES, AND ACCIDENTS

The reactor has in the past experienced a persistent pattern of numerous unscheduled shutdowns, abnormal occurrences, and accidents. These occurrences are so pervasive that they evince a pattern of unreliability which makes it impossible for the Applicant to reasonably assure that the reactor can be operated in a manner which does not endanger the public health and safety.

a. A review of UCLA's annual reports for the years 1971-1978 indicate forty-five unscheduled shutdowns and four abnormal occurrences. During this period the reactor was shutdown for several extended periods totalling approximately in excess of one and one half years. The major shutdowns were due in part to the 1971 earthquake (the resulting maintenance required the exposure of three workers to greater than 5 rem/year each; pg. 6 1972 Annual Report), a coolant leak in 1974, and a leaking Radium-Berylium source in 1975.

Some examples of the causes of the scrams are: "Operator made incorrect range change. Ranged up rather than down. Operation was reviewed with operator." "Operator inadvertinently [sic] pressed scram switch while lecturing on console instrumentation and circuitry. Revised lecture procedures." (annual report 1971, p. 1). Another scram which raises questions about the general reliability of the reactor operation occurred in 1977 when the reactor supervisor blocked the main exhaust vent to prevent a tritium build-up, causing the Argon-41 monitor alarm to go off. "The supervisor was cautioned to exercise more diligence in the future." (annual report 1977, p. 2-3).

Only two of the inspection reports available to Petitioner at this time give a yearly average for the rate at which spurious scrams occur. The figures are .923 per month and 1.14 per month from Inspection Report 68-01. Those rates correspond to rates of roughly 240 per year for full time operation (facility operates about 5% of the year), a rate that would clearly be unacceptable in a big power plant or any other facility that could pose a safety hazard.

b. The Applicant also has a history of leaks and spills. Leak in reactor shield tank found in 1968--CO Report No. 50-142/68-2. Coolant leak late in 1974 "required reactor down-time from mid-August to early December." and down again from November 23, 1975 to March 18, 1976 to replace a leaking encapsulated neutron source." Catton, 1976 Annual Report, p.3. In 1979 demineralizer tank on the floor directly overhead of the console leaked--leak continued all weekend as the staff of NEL did not know how to turn it off and didn't check to see whether someone from physical plant had taken care of the problem--short-circuiting console instrumentation, necessitating a week's shutdown for dry-out and repair. (Daily Bruin, November 21, 1979). Summer 1979 spill of radioactive liquid during clean-up from previous week's spill due to failure of sample and pneumatic tube, necessitating clean-up and replacement of tube. (KNBC report October 1, 1979). The reactor also sprung a leak in a reactor gasket in 1974 (RO Inspection Report 50-142/74-01.

The above-mentioned shutdown, leaks and abnormal occurrences do not by any means represent all of the instances of reactor events substantially outside normal operating procedure. They are intended merely to show that there is a basis for the concern about an apparent history of operational unreliability that can represent a pattern of sloppiness on the part of personnel and unreliability on the part of reactor equipment that can pose significant safety hazards in the future, particularly when coupled with the safety inadequacies in other portions of this series of contentions (see particularly inadequate calibration, managerial controls, lack of safety features, and violations of regulations contentions.) There is considerable basis from the brief operational history cited above to base a contention that the Applicant has not reasonably demonstrated that the reactor operation is reliable, that a good safety record exists, and that the reactor operation will not endanger the public health and safety.

Reactor shut down by water damage

By Mary Astadourian
Staff Writer

A water leak developed in the control room of the Boelter Hall nuclear reactor over the weekend, causing extensive damage to the main control panel, and rendering the reactor inoperable for a week or more.

An anonymous phone caller told the Bruin about the leak, which started Friday in the de-ionized water tank, and rapidly incapacitated the control room but did not release any radioactive water.

Reactor supervisor Chuck Ashbaugh confirmed the report Tuesday. Ashbaugh explained that two weeks ago the main water pipe in the School of Engineering broke. A temporary pipe was installed but not depressurized.

"This increase in pressure caused the machine that makes purified water for the reactor to leak," Ashbaugh said. He also explained that this water is used for experiments and "doesn't belong to the reactor."

The damage, according to Ashbaugh, is not serious. "Some of the instruments got wet and we're drying them out," he said, adding, "We don't think that anything got burned out, just wet."

Ashbaugh believes it will cost about $500, primarily for labor, to get the reactor operating again.

The anonymous caller blamed the damage on Ashbaugh's carelessness. The caller reported that Ashbaugh discovered

(Continued on Page 11)

Reactor . . .

(Continued from Page 1)

the leak on Friday afternoon but called the Physical Plant Office and told them to do it, shut off the water valve, because he did not know how. But he forgot to check and see if they did, the caller said.

Ashbaugh denies this. "Two people from Physical Plant came Friday morning and said that they would take care of the leak — it was just a few drops at the time," he said. Ashbaugh believes the major leak began over the weekend when the reactor was not in operation and when none of the reactor personnel was present. "The custodian found it and told the custodian supervisor, who called Physical Plant," Ashbaugh said.

Ashbaugh said he would allow the Bruin to take pictures of the damage in the Nuclear Energy Laboratory. However, Dean Tom Collins of the School of Engineering refused to allow a Bruin photographer to do so. "You can clarify the incident," said Collins, "but I don't think you need any pictures."

Daily Bruin 11/21/79

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VIII. FAILURE TO MEET 10 CFR 100
SITING CRITERIA REGARDING RADIATION RELEASE IN AN ACCIDENT

The Applicant has failed to meet the siting criteria of 10 CFR 100 regarding radiation exposure in case of an accident. The calculations contained in the SAR are based on numerous assumptions that unrealistically minimize the extent of exposure in case of a major release of fission products, and that even with these unrealistic assumptions, Applicant's own SAR indicates that it is in violation of 10 CFR 100 standards for thyroid dose to the public in case of a major accident. The standards set a limit of 300 rem for thyroid exposure (10 CFR 100.11(a)(1) & (2)) and the Application finds that the possible dose from a reactor accident is 1300 rems for thyroid dose. (Application at III/B-6)

Specifically,

1. Even with numerous unrealistic assumptions, outlined below, and despite claims to the contrary, UCLA's own SAR indicates that an accident would cause public exposures in excess of the limits in 10 CFR 100.11(a)(1) and (2). The regulations require that applicants for licenses demonstrate that members of the public would not receive thyroid doses in excess of 300 rems in event of a major accident involving significant fuel melting and fission product release. The Application, despite many unrealistic assumption which limit the estimate of release, indicates a thyroid does of 1300 rems, considerably in excess of the limit.

This is in direct contradiction to the statement on page II/3-1 of the Application which states:

> Accidents ranging from failure of experiments to the largest core damage and fission products release considered possible

> result in doese of only a small fraction of the 10 CFR 100 guidelines and are considered negligible with respect to the environment.

This statement - - which appears to have been taken word for word from page 3 of a January 1974 memo about <u>all</u> research reactors written by Daniel Muller, Assistant Director for Environmental Projects, Directorate of Licensing, AEC, called "Environmental Considerations Regarding the Licensing of Research Reactors and Critical Facilities." Applying this assertion to the UCLA reactor is clearly inappropriate in light of the Applicant's own figures on page III/B-6. 1800 rem to the thyroid is certainly greater than the 10 CFR guideline of 300, not "a small fraction of the 10 CFR 100 guidelines."

2. The analysis is considerably flawed, in part because of its age, in part becuase of its reliance on dated references, in part becuase of changes in reactor characteristics and the site at which the reactor is located and largely because of highly unrealistic assumptions.

a. Applicant assumes a release that is limited to only 10% of the volatile fission products and none of the non-volatile products. This is a completely unrealistic assumption. To meet 10 CFR 100, one is required to use the following assumptions:

> The fission product release assumed for these calculations should be based upon a major accident, hypothesized for purposes of site analysis or postulated from considerations of possible accidental events, that would result in potential hazards not exceeded by those from any accident considered credible. Such accidents have generally been assumed to result in a substantial melting of the core with subsequent release of appreciable quantities of fission products.
>
> - footnote to 10 CFR 100.11(a).

This particular reactor need not consider core melting, merely cladding melt, because it has no containment structure and admits that the cladding is the "principal barrier " against radiation release. (Application V/1-4)

Applicant assumes that "none of the nonvolatile fission products are transferred to the building air..."

> The foregoing set of circumstances is consistent with the reasonable assumptions made here that the incident is not violent enough to blow off the top and side biological shields so as to cause an intense spary of water-steam-radioactivity mixture into the building.
>
> Application, page III/B-1

This is a most unreasonable assumption. A steam explosion is a very clear possibility. 10 CFR 100 provisions are to be met by considering the maximum credible accident, not a medium-sized accident. The biological shield for this reactor is not designed to prevent such a steam explosion and is not bery strong. There is absolutely no reason to rule out the possibility of such an occurance.

WASH-740, in its discussion of the possible consequences of major accidents at nuclear plants, used two scenarious for release: 100 percent of the volatiles plus one percent of the Strontium; and 50 percent of the volatiles plus the non-volatiles. It was these assumption that should have been used by the Applicant. Assuming no volatiles are release and only ten percent of the volatiles is an assumption that could result in a considerable underestimation of fission product release, at least by an order of magnitude.

b. Applicant assumes reactor has been operated at 10 kw "long enough to have attained equilibrium concentrations of relatively short-lived fission products, i.e. the iodine, bromine, and krypton isotopes." (p. III/B-1). The reactor is now at ten times that power level. Applicant argues on page III/B-1

> The calculation of fission product inventory is based upon a steady state equilibrium inventory at 10 kwt, and certain assumptions concerning leak rate from the building.
>
> The consequential dose calculations were apparently unreviewed in the approval of Amendment 3 (1963) that increased the maximum licensed power level to 100 kwt. They were reviewed by the

> Division of Licensing and Regulation in procession the application for Amendment 7 (referred to above) /increasing limit on excess reactivity/. In view of the current restriction of the UCLA Reactor operating hours to 5% of the year, the maximum average power is now 5 kwt, a factor of two less than the 10 kwt used in the original calculations.

The above argument by the Applicant cannot be supported. The Hazards Analysis from 1960 based its calculations on 10 kwt, but did not assume that it ran 100 percent of the year, only "long enough to have attained equilibrium concentrations of the relatively short-lived fission products." While UCLA is limited to operating five percent of the year at 100 kwt, there is no evidence presented to show that its maximum fission product inventory is half that of a reactor which runs at 10 kwt "long enough to have attained equilibrium concer ations" of the short-lived fission products. Neither the very long-lived nor the very short-lived isotopes would be affected by UCLA's current five percent restriction; UCLA could run continuously for 18 days at 100 kwt, or 36 days at 50 kwt, or three months continuously at 20 kwt and still be within its licensed limit. The Application does not state the "equilibrium period." It is possible that the equilibrium period and UCLA's current restriction could match. Furthermore, the only part of the inventory affected by five percent restriction, if any is at all, would be the "relatively short-lived fission products" -- the others would be unaffected. No attempt has been made to accurately determine the maximum fission product inventory of the reactor at 100kwt and five percent of the year operating limit. It is clear that it is very unlikely that the reactor at 100 kwt would have a maximum .nvertory of one-half of the reactor inventory at 10 kwt, even with the former restricted to 438 full-power hours per year and the latter measured at the end of the equilibrium period for relatively short lived products. It should also be noted that the calculations at 10kwt assumed that the reactor operated only 20 percent of the time. See, 1960 Hazards Analysis at page 62. It is clearly possible that the failure to recalculate possible release levels at 100 kwt could result in an underestimation of the release by nearly an order of magnitude.

c. Applicant assumes the reactor is in a two-story building with place possible exposure to the public occuring outside the building. That analysis was useful in 1960 when those were the conditions at hand; however, now the reactor is housed in a massive building complex used by perhaps several thousand students, staff, and faculty. The calculations based on plume travel time and air dispersion are obviously useless when people now can be exposed not merely on the outside of the building as the radioactive gas passes but by being immersed in radioactive gas which passes throughout a huge building aided by the ventilation systems. Exposure models for inside the building clearly must be used. The Applicant did not use such models. This could result in significant underestimation of exposure.

d. Page III/B-2 assumed a building leakage rate of 20% of the reactor room volume per hour for a 30 mile per hour wind, assumed to be directly proportional to wind velocity. This assumption is erroneous in part because it is based on leakage out of the building into the open air instead of the current situation in which a primary area of exposure would be leakage out of the reactor room into other parts of the Boelter complex and in part because the assumption is predicated on the assertion that "all access doors will be weather-stripped and emergency doors leading directly to the outside, caulked and sealed for minimum leakage." Any such attempt to prevent air leakage has long since been removed, as evidenced by the massive airflow under the doors because of the negative pressure kept inside the reactor room under normal operations due to venting up the stack. If the stack is shut down, as it is supposed to be in an accident, that negative air pressure will cease and the radioactive material will flow out the same way the air previously flowed in. Any accident generating enough heat - - and perhaps a steam explosion - - to melt the cladding would create an overpressure inside the reactor room that would force the air out. Once out of the reactor room area, the building's normal air circulation system will very effectively transport it throughout the building. The assumption of 20 percent release per hour in a 30 mile per hour wind outside (two percent release per hour in a three mile per hour wind) with the only exposure being to someone outside the building is thus a vast underestimation, caused no doubt by the difference in situations in 1960 when the analysis was done (before the buildings were added to the reactor structure) and today.

e. Finally, the use of references from 1958 when new dose and dispersion models are now available, the failure in twenty years to test any of the assumptions upon which the analysis is based (e.g. why estimate who much of the reactor air volume would leak per hour - - why not measure it?) make the analysis worthless, particularly given the changes that have taken place in the reactor since the analysis was done. It is not the same reactor that the 1960 Hazards Analysis analyzed. An analysis twenty years old should not be used to demonstrate the safety of a current reactor for the twenty years to come. The Hazards Analysis was so far off in its estimation of Argon Emissions (p. 62 of the Hazards Analysis estimates at a radioactive concentration of 8.2 μc per cm^3 of air when air flow of 5000 cfm and reactor running twenty percent of the year. Current air flow is three times that and the reactor is restricted to five percent of the year; despite the fact that the concentration should be twelve times less than the Hazards Analysis predicted, it is actually ten times more - - an error of two orders of magnitude. This certainly casts doubt on the accuracy of other estimates in the Hazards Analysis.

> Although the reactor is designed to operate at a maximum steady power of 10 kw, it is not planned to perate it at this power level continuously. Much of the operation for the training program will be at considerably lower power levels and will be intermittant. It is estimated that the reactor will be in operation [about 1800 hours each year or about 20 percent of the total time]. With this type of operational program, no very large amount of new fission products will ever exist in the core.
>
> Hazards Analysis at page 59.

Thus, the Hazards Analysis was not considering the 1960 reactor to be running full time at 10 kwt as the SAR would suggest; thus the assumption that the present 100 kwt reactor's maximum inventory would be less than it was at 10 kwt seems highly questionable.

Finally, it must be said that the following statement in the Hazards Analysis section on radiation doeses is clearly challenged by what has been shown in the section on Excess Reactivity.

> ... such an event is not considered even plausible because of the limitations on available excess reactivity and because of the inherent self-limiting characteristics of the reactor...
>
> Application at page III/B-1

Petitioner has shown elsewhere that since the Hazards Analysis was written the excess reactivity permitted has been increased to well over the amount necessary for prompt criticality and indeed perhaps the amount needed for cladding melting, and that the inherent self-limiting characteristics of of the reactor thought to be existing in 1960 as the Hazards Analysis was written are either no longer in existence or never were (the deflector shield has been removed, no longer protecting against repeated excursions; there may well be a positive temperature coefficient because of the graphite moderator; and so on.) Despite all of these changes and erroneous assumptions, the Application still shows that the potential dose to the thyroid excees permissible levels according to the siting standards set out in 10 CFR 100.11(a).

/

IX. INADEQUATE MAINTENANCE AND CALIBRATION

The Applicant, in the past, has not adequately maintained its equipment nor calibrated its instruments properly, thereby increasing the chances of equipment failures and erroneous instrument readings. Applicant has failed to demonstrate that its maintenance and calibration effort will improve in the future. This failure precludes the conclusion that the issuance of the license will not be inimical to the public health and safety.

1. Applicant has failed to calibrate instruments at the required intervals.

a. Inspection Report 050-142/75-01 reports as an item requiring enforcement action:

> The licensee had not calibrated the reactor room area radiation monitors and the radioactive gaseous effluent monitor at the frequency required by the Technical Specifications.
>
> p.1

b. The same Inspection Report indicates that the Gaseous Effluent Monitoring system was also required by Section V.C. of the technical specifications to be calibrated semi-annually, and that

> the maintenance log shows no record of this monitor being calibrated. The licensee representative against stated he was unaware of the semiannual requirement of the tech spec...
>
> p.7

2. Applicant's personnel are not familiar with the calibration requirements of their own technical specifications.

a. The Inspection Report mentioned above explains the calibration violation in part on the present Applicant's ignorance of the requirements in their own technical specifications:

The licensee representative stated that the area monitors were last calibrated about one year ago. The representative was unaware of the requirement for semiannual calibration and was under the impression thatthe calibration frequency was the same as for nuclear instrumentation (annually).

p. 6 75-01

3. Applicant has failed to maintain, or has lost, calibration records, making accurate instrument calibratins and data interpretation impossible.

a. 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 the documentation no longer exists which shows how the curve was developed or what error it may have.

inspection report 75-01 p. 6-7

b. The Applicant lost the facility's maintenance log for all years prior to 1974, thus making accurate maintenance and calibration far more difficult because previous results were unavailable for comparison, along with records of calibration and maintenance methods. (SEE NRC Notice of Violation dated October 15, 1974:

Section VIII k.e of the technical specifications requires that a record be kept of the principal maintenance activities and the reasons therefore.

Contrary to this requirement, the record of maintenance activities prior to May 1974 was missing. (Severity Category III)

4. Applicant has significantly underestimated radioactive emissions for extensive periods of time due to errors in its calibration methods.

a. The licensee stated that a recent calculation performed to compare the existing response of Ar-41 to C-14 indicates that the existing calibration curve is <u>in error by a factor of ten</u>. The licensee representative further stated that he is convinced <u>these</u> calculations are correct....

p. 7 (emphasis added)

b. The calibration error reported above, when corrected, was not, as the licensee insisted above, the only error. When Argon emissions records were finaly corrected, it turned out the error was actually a factor of 300. Charles E. Ashbaugh III, then-Reactor Supervisor, in a letter to David Jaffee, USNRC Directorate of LIcensing, on April 23, 1975, corrected previous years' reports of Argon emissions. As is quite evident, the error was much larger than just a factor of 10:

> 1971 -124.9 Ci released instead of .303 Ci reported
> 1972 - 41.9 Ci released instead of .1046 Ci reported
> 1973 - 52.9 Ci released instead of 0.248 Ci reported
> 1974 - 56.2 released instead of 2.39 Ci reported
>
> (the last year the facility had detected the initial calibration error and compensated for it by multiplying their readings by 10)

5. Applicant has had continuing problems with heat balance calibrations.

a. Inspection Report 68-1 indicates a long-term problem with key nuclear instrumentation related to calibration discrepancies:

> Entries in the console logbook and reactor checkout forms indicated that the nuclear instrumentation had performed correctly during the period covered by the current visit. A possible exception would be several occasions wherein nuclear instrumentation power level indications were not consistent with heat balance calculations. However, the maximum speed was noted to be approximately five percent and detector positioning corrections were made without undue delay. Dr. Smth said that the nuclear instrumentation--heat balance power level discrepancies have been a long-term, but not increasing problem. He said that work was continuing to stabilize nuclear channel long-term operation so that the need for detector relocation can be kept to a minimum.
>
> p. 5-6, emphasis added

b. There is no indication in subsequent inspection reports thatthe heat balance problem has been resolved.

c. Applicant's report of only one hour of reactor operation for maintenance and instrument calibration means that the heat balance calibration was not done last year, because it takes considerably longer than one hour to do said calibration.

d. Applicant's technical specifications included in the application differs from those previously in effect in that the requirement for conducting heat balance calibrations is not any longer in the tech specs.

6. Applicant has, by making undeclared changes in their technical specifications, relaxed or discontinued essential calibration standards and requirements.

a. Applicant, despite statements that no changes of substance between the present Tech Specs and the ones included in the Application exist besides those outlined in the forward, has relaxed some instrument calibrations without so declaring. This relaxation, especially in view of laxity in periodic calibrations, seems quite unwarranted. Specifically, the present tech specs say that the log N period channel, the power level safety channels, and the linear power level channel will be "calibrated at intervals not exceeding 12 months, or any time a change in channel performance is note." (p.5) However, the new tech specs say:

> The requirements listed below generally prescribe tests or inspections to verify periodically that the performance of reqired systems is in accordance with specifications given above in Sections 2 and 3. In all instances where the specified frequency is annual, the interval between tests is not to exceed 14 months; and when semiannual, the interval should not exceed 7 months.
>
> V/4-1 Application

b. Applicant has also removed, without so declaring, the requirement that "the neutron channels shall be calibrated against an independent measure of core power at intervals not to exceed 12 months."

7. Applicant has not devoted adequate time to maintenance and calibration

Page III/1-5 of the Application states that only one hour of reactor operating time was spent last year in maintenance tests or instrument calibrations required by the reactor's technical specifications.

The Technical Specifications requirements ca-not possibly be met in one hour of reactor operation. The "heat balance" alone takes longer than that. It is clear that the reactor simply did not do most of the maintenance and calibration last year that is required by the tecnnical specifications.

A review of the correspondence bibliography between the Applicant and the Commission fromthe early sixties on indicates that the calibration problems have been long-term and are continuing. There is no indication that the managerial and administrative problems which underly the calibration inadequacies will be resolved in the future. Applicant must demonstrate that these problems will be resolved in order to meet the burden of providing reasonable assurances that regulations will be complied with and that the public health and safety will not be endangered as required for the issuance of a license.

X. INADEQUATE ENVIRONMENTAL IMPACT APPRAISAL

The Environmental Impact Appraisal submitted by Applicant is lacking in detail, largely copied from material not related to this particular facility, relies on unsupported assumptions and conclusions and is generally so inadequate that it cannot possibly support the issuance of a license or support the finding by the Commission that the licensing is not an action that significantly effects the quality of the human environment.

1. Lack of original environmental impact appraisal for this reactor. Applicant has ostensibly filed an EIA for this particular reactor, but much of the language has been lifted, without attribution and virtually verbatim, from Daniel Muller's AEC memo of January 23, 1974, on "Environmental Considerations Regarding the Licensing of Research Reactors and Critical Facilities." There is virtually nothing on pages II/3-1 through 7-1 that was written by the Applicant nor can it be said that the contents of those pages represent a review of the environtal aspects of Applicant's specific facility. Applicant has made no showing that Muller's general conclusions fit the specific circumstnces of UCLA, nor for that matter did they identify the language as anything but their own.

2. Analysis of environmental effects of facility operation inadequate. Applicant's description and analysis of the environmental effects of the normal operation of the reactor, is based on faulty assumptions and unreliable monitoring equipment and methods.

a. Applicant has failed to discuss the effect of gaseous emissions other than through the reactor stack.

b. Applicant's definition of background radiation cited on page II/2-1 as approximately 0.04 ± 0.03 mrem/hour, or 350 mrem $\pm$ 262 mrem

/year means that radiation levels of 612 mrem/year would be ignored by Applicant as background and insignificant even though background in Los Angeles is considered to be 80 to 100mrem/year.

c. Applicant in interpreting its film badge data fails to analyze and predict the total gamma plus beta radiation dose based on the beta readings of the badges. This failure leads Applicant to understate the impact of its emissions by a factor of four.

d. The significant discrepancies between the film badge readings and the TLD reading, and among the TLD readings themselves, indicates that the Applicant has not demonstrated accurately what the levels of radiation it emits are, and has no basis for a conclusion that there are no significant levels of radioactive emissions reaching uncontrolled areas.

e. A more detailed discussion of the levels of radioactive effluent given off by Applicant in its normal operation and its inability to monitor and measure such emissions can be found in the contentions on excessive emissions, and inadequate maintenance and calibration.

3. <u>Analysis of environmental effects of accidents inadequate</u>. Applicant's description and analysis of the environmental effects of accidents is cursory and conclusory, despite the fact that a major accident at this facility could endanger thousands of lives.

a. Applicant uses verbatim the language from Muller's memo on research reactor impacts without any attempt to justify the application of his conclusions to its facility.

b. Applicant's conclusion that the releases from the greatest core damage possible are within the limits of 10 CFR 100 are not supported by any data whatsoever. In fact the conclusion is inconsistent with the data included in other portions of the Application. (see contention on compliance with 10 CFR 100)

c. Applicant's statement that the reactor was subjected to experimental vibration and that the results were published in a paper by C.B. Smith, is inadequate to support any conclusion. Especially, given the fact that the vibration test caused some damage to the reactor, and that the facility was shut down for seven months for repairs following the 1971 earthquake. (see contention on seismic vulnerability)

d. This reactor facility is vulnerable to a major accident with serious consequences for the public health and safety. The reactor operates at or over the limits for prompt criticality, in a facility plagued with managerial problems, and in a building surrounded on three sides and attached to large classroom facilities. Given the reactors lack of self-limiting features and its close proximity to thousands of people, the facility represents a major potential environmental effect in the case of an accident. (see contention on the maximum credible accident).

4. <u>Applicant does not discuss, analyze or describe any alternatives to the operation of the reactor facility.</u>

a. Applicant's conclusion that there are no suitable and economic alternatives to the reactor is taken directly from Muller's memo and is not supported with any discussion or data regarding the UCLA facility.

b. Alternatives to the reactor do exist, both for research and for training and education. In the research area for example the Medical Center has its own cyclotron for making isotopes. Furthermore, the Nuclear Energy Lab has experienced a major decrease in research activity by University researcher in the past several years, due to low power and antiquated design. Nothing could indicate more clearly that there are alternatives to the research uses of this reactor. (see contentions on wrong class license)

c. The minimal use of the reactor for education and training, 34 hours or 8%, in 1979, suggests that such education and training might well be conducted more efficiently at other facilities in the Los Angeles area.

d. Applicant cites the use of the reactor as a public relations tool as one to which there is no alternative. Petitioner submits that since, under the regulations the public cannot run the reactor, any purpose could be accomplished with a reactor mock-up.

5. Applicant's discussion of the long term effects of the reactor is conclusory and inadequate. In fact, they fail to mention the impact of decommissioning the reactor, a $753,000 item in 1980.

6. Applicant's discussion of the costs and benfits of the reactor is inadequate and conclusory.

a. The value of the education of students is minimal given the small amount of reactor time devoted to it.

b. Applicant fails to discuss the need for the facility in light of the decline in the use of the facility for research by University personnel.

c. Applicant fails to discuss the value of the facility as a training tool in light of its antiquated design, or the fact that such training could well be done at other facilities for much less cost than running the UCLA reactor.

d. The applicant in concluding that alternatives to the reactor operation would be more costly for some of the activities conducted fails to consider that the cost of doing certain experiments on different types of equipment is irrelevant if the research is not being conducted at the reactor anyway.

e. The applicant fails to give any data on the cost of using alternative facilities or means to conduct the activities that now on at the reactor.

The application submitted by the Applicant represents a total failure to comply with the intent and spirit of NEPA. Applicant has failed to adequately explore and discuss alternatives, costs and benefits, and above all has not accurately assessed the effect of the issuance of the proposed license on the quality of the human environment. Given such failures this appraisal cannot support the issuance of a license or support the finding that the action will not have a significant effect on the quality of the human environment. Furthermore, it is contended that the issuance of this license will indeed have a significant environmental impact and that therefore an Environmental Impact Statement should be prepared on this action. Finally, Petitioner would like to note that it wishes to be apprized of any and all opportunities for public input into the environmental impact and assessment process consistent with Council on Environmental Quality regulations.

XI. LACK OF ADEQUATE SAFETY FEATURES

Applicant lacks key intrinsic and engineered safety features and other safety features are substantially inadequate; particularily lacking are features that are redundant and independent. Furthermore, a number of safety features built into the reactor initially are no longer existent.

The intrinsic safety features of the reactor have been substantially mitigated or removed. The 1960 Hazards Analysis for this reactor begins a discussion of "General Safety Considerations" with the following statement:

> The inherent safety of the reactor is based on four points. First, the amount of excess reactivity in the reactor is limited to about 0.6%. Second, the reactor has negative thermal and void codfficients. In addition, the reactor is provided with sufficient interlocks and safety trips to make a hazardous incident extremely improbable. Third, the amount of contained fission products will be relatively small since the reactor is to be limited to a maximum power of 10 kw. Fourth, there is no credible way in which the fission products can be made to escape.
>
> p. 59

As we shall see in what follows, each of the above four bases for the supposed inherent safety of the reactor has since been substantially mitigated. First, the amount of excess reactivity in the reactor is no longer limited to .6%. Second, the reactor has a positive thermal graphite coefficient. In addition, the reactor's staff has over the years found ways to disconnect the interlocks and safety trips, and the value of the latter has been brought into serious question by the lack of accurate calibration, particularily heat balance instrument calibrations. Third, the amount of contained fission products is no longer small relative to twenty years ago since the reactor power limit has increased to 100kw. Fourth, there are a number of credible ways in which fission products can be made to escape. (for a detailed discussion of excess reactivity see contention V , release of fission products contention VII) In this section, we will show how some of the key safety features have been removed, others were discovered to not exist as previously thought, while still others have never existed or have been proven to be substantially inadequate.

1. Positive Temperature Coefficient for Graphite. The reactor was apparently built with the assumption of a negative temperature coefficient based on the negative coefficient for water; but since the reactor is also moderated with graphite (graphite is also used as a reflector), temperature effects on graphite must be considered. Eight years after the Hazards Analysis upon which most of Applicant's current SAR relies was written, an AEC inspector reported the following (Inspection Report 68-01):

> A report to the Commission by the University of Washington (letter to D.J. Skovholt from A.L. Babb, dated January 4, 1976) deals with a positive graphite temperature coefficient which had been noted during operation of the University of Washington Argonaut reactor. As a result of the subject report, an effort was made during the current visit to identify possible similar effects relative to operation of the UCLA Argonaut reactor.
>
> Dr. Smith informed the inspector that he had received a copy of A.L. Babb's letter and that he had attempted, unsuccessfully, to measure the effect of graphite heating in the UCLA reactor. He said that preparations for the test had involved the fabrication of a graphite log, which was to be inserted adjacent to a fuel can and heated, incrementally, to determine possible reactivity effects. Smith said the experiment had never been performed because the heater wires around the graphite log persistently "burned out" during out-of core tests. He said the problem was one of inadequate heater wire insulation.
>
> However, during the review of the console logbook, the inspector noted that several, three to four hour, reactor operating periods at 100kw had been performed. By reference to the console logbook data concerned with core reactivity changes as a function of time and the temperature of the water moderator, it appears that a positive graphite temperature of 0.006% k/k/oF exists. This is about one-half of the coefficient measured during the University

> of Washington experiment. Dr. Smith said that in spite of the foregoing, he intended to experimentally determine the graphite temperature coefficient as soon as promising test equipment could be developed
>
> p. 6 (emphasis added)

It is unclear from any of the documents available to us at this time whether further tests were ewer conducted.

The positive nature of the coefficient for graphite found at University of Washington and at UCLA is confirmed by the experience of the SRE, which was also graphite moderated. Thompson and Beckerley, in The Technology of Nuclear Reactor Safety (prepared under the auspices of the U.S. AEC, Vol. I, p. 643 (1964)) indicate that during the power excursion that contributed to the partial meltdown of the SRE,

> the slow but steady rise at a rate of +0.04% in a 3 minute rampt in spite of gradual control rod insertion and the negative Doppler effect is attributed to an abnormal rise of the temperature of the moderator [graphite] which has a reactivity coefficient of $+1.7 \times 10^{-5}$/°F and perhaps also to some sodium vapor formation in partially plugged channels. (The sodium void coefficient is positive...)
>
> p. 643 (emphasis added)

Note in particular that the temperature coefficient estimated for the UCLA graphite, +.006%, is greater thatn the water coefficient of -.0048%. If the University of Washnigton coefficient is more accurate than the inspector's logbook calculations, then the difference is even more significant. In either case, the self-protection inherent in the negative temperature coefficient of the water appears to be more than offset by the positive graphite coefficient, therefore an important inherent safety feature designed into the system does not appear to exist. In addition, the void coefficients used by Applicant are calculated based on water voids and may not have taken into account any factors arising from the fact that this reactor is both water and graphite moderated.

2. Deflector Shield Removed. The language on page 27 of the 1960 Hazards Analysis report when compared with the language of the SAR suggests that the deflector shields may have been removed.

> The top of each box is closed by a plug (Figure II-8) which extends upward through the graphite which forms the base for the vertical thermal column. The upper part of the plug consists of 8-3/8 inches of graphite on top of four inches of lead. The lower part of the plug consists of a flanged section which fits at the top of the fuel box, and a deflector plate. The diaphragm is used to keep water vapor from the boxes from getting into the graphite space where it might condense. In case of a power excursion of sufficient magnitude to expel water from the fuel boxes, this barrier would be easily broken by the force of the water. The deflector plate located above the diaphragm insures that water, once ejected from the box, will not find its way back.

If one compares the above language with p. III/5-8, one finds that once again the SAR is a virtual copy of the 1960 HA, except in this case the mention of the deflector plate has been removed. There is language on page III/A-6, another section copied from the old HA, which discusses the "baffles" on the UCLA reactor. It would appear then that either the reference to the deflector should not have been removed from the language on page III/5-8 or that the deflector itself has been removed.

B. The engineered safety features are inadequate to protect the public health and safety. The Technical Specifications included in the Application list only two Engineered Safety Features, a containment and a safety high level radiation monitor. Petitioner contends that there is no containment and that the safety high level radiation monitor is inadequate. Sicne Applicant fails to list any other engineered safety features in the Technical Specifications, or anywhere else in the application, one must conclude that the facility lacks such other features.

1. No airtight containment structure exists for this reactor. On p. V/1-4 of the application, Applicant indicates that the "principal

physical barrier" against release of radioactivity is the fuel cladding As William Kastenberg, then UCLA reactor director, wrote to Karl Goller, Assistant Director of Operating Reactors for the NRC on November 5, 1975:

> The UCLA reactor was designed and built before the irradiation and diffusion of interstitial air (with Argon-41) became a recognized problem. The biological shield is stepped and reasonably well designed to eliminate streaming radiation, it was not designed as a containment vessel.
>
> Kastenberg letter p. 4-5 (emphasis added)

The Applicant also described the lack of a containment vessel in the original Hazards Analysis: "Therefore, no containment vessel has been provided for the building and no airlock closures have been provided." (HA, page 18).

The reactor is simply placed in a room in a building. In fact, as part of the reactor operation, the air pressure in the room is kept slightly negative, requiring air flow spaces under the doors and other places. When the reactor is operating these spaces must be sufficient to allow at least 14,000 cubic feet of air per minute to flow into the room as the exhaust fan pushes it out of the exhaust stack. In the event of an occurence whereby fission products were released and the room pressure went positive (likely when the exhaust stack is closed in emergencies) there would be no barrier to prevent the contamination of the surrounding areas.

2. The High Level Radiation Monitor system is inadequate. Applicant has received notice of violations from the NRC for bypassing the scram circuitry and shielding the monitor in other radiation systems, indicating an insensitivity to the importance of these safety monitoring devices. Further, the Applicant was cited in 1975 for failure to calibrate the reactor room radiation monitors at the required frequency. (Inspection

Report 050-142/75-01, p.1)

3. Lack of Emergency Control Systems. The Application and the other documents presently available to Petitioner do not mention any of the following emergency systems: an adequate boron-injection system, radioactivity removal system, emergency liquid and gaseous emissions holding tanks, HEPA filters, emergency core cooling system, an emergency set of control blades, or spare control blade motors. Lacking such systems Applicant cannot reasonably assure that the public health and safety will not be endangered.

4. Lack of adequate Shielding and Access Restriction in areas where the public might be exposed to radiation. The reactor building does not include adequate shielding, particularily above the reactor, to protect persons outside of the reactor building.

a. The reactor building was constructed without a view toward shielding as it was a self-contained and separate building. Now the reactor building is surrounded by classroom buildings including directly overhead. In recognition of the lack of shielding in the reactor roof, the third floor void area is interlocked to prevent reactor operation when someone is working in that area. However, the probability of irradiation on the third floor raises a serious question about the lack of any shielding for the persons who work and attend classes above the void area.

b. The area on the third floor directly above the reactor is fenced in as is the area directly above the adjacent Tokomak laboratory. However, there is a heavily used walk way between these two fenced in areas. The question is raised as to how it can be dangerous enough to fence in the areas above the labs yet safe enough to allow people to walk between the fences.

c. The roof areas surrounding the reactor exhaust stack on Boelter Hall and the Math-Sciences building are readily accessible to the public. The roof is accessible through two elevators and several unlocked doors. There are no fences restricting foot traffic, nor radiation hazard signs warning people on the roof. There is one locked door to this "restricted area" however, during at least one NRC inspection this door was found to be propped open:

> During a tour of the area by NRC inspectors it was observed that one door to the roof area had been propped open and access not adequately limited at that time. Licensee representative indicated that this was unexplained and unusual and that the limited access control plan would be reviewed with physical plant personnel to assure that the doors to the roof area remain locke and access will be controlled and limited to reactor staff and physical plant maintenance personnel who are aware of the restrictions.
>
> Inspection Report 50-142/76-02 p.2

5. Inadequate or Non-existent Interlock Systems. Applicant has inadequate interlocks and has in the past by-passed such systems as it has. In 1968 Applicant was cited by the NRC for by-passing and shielding safety interlock systems, increasing the chance of excessive irradiation of personell or other accidents. (Inspection Report No. 50-142/69-1 p. 4)

6. Lack of missile shields, particularly for control blade drives. No information provided in Application indicates that any missile shields exist at all.

7. Hazard from swelling of graphite in reactor core. As the Piqua and Hallam reactor experience shows, graphite used in reactors has a tendency to swell and crack. In this facility, control blades can stick or have trouble getting inserted, and other damage to fuel assemblies or otherparts of the core can ensue. A thorough analysis of this potential problem is lacking from the Application.

8. FUEL FAILURES. Applicant has had a history of fuel failures, particularly tie bolt failures, which raises questions about thermal stresses, warping, etc. In addition, in Application p. III/6-2 in describing who constructed fuel for the facility, it is mentioned that A.I. did the fuel, then in parenthesis (2nd time). Was there something wrong with the first fuel? This should be explained in the Application.

9. CONTROL BLADE PROBLEMS. Perhaps the most worrisome of these safety problems are the persistent problems the Applicant has with the control blades. They have often become stuck: after earthquake simulation reported on in 1968 inspection report; inspection report 74-01 deals with a sticking control rod drive in May 1974; and just last December an NRC inspection report once against dealt with control blade problems. In addition, the control blade drive logic has malfunctioned, Under abnormal occurences in the 1975 Annual Report, the following incident is recorded:

> the reactor operator noted that the control rods were not functioning normally. This can be summarized as follows: (1) Rod #1 would not drive out when the "rod drive up" switch was depressed and rod #1 and rod #2 would both drive down when the "rod drive down" switch was depressed. (2) Rod #2 would not drive either way. (3) Rod #3 would not drive either way. (4) Rod #4 would not drive out when the "rod drive up" switch was depressed and rod #2 and rod #4 would both drive down when the "rod drive down" switch was depressed.

As we have seen in the contention on reactivity, reactivity control mechanisms for this reactor in particular are essential to work without problems. The control blade problems sketched out above raise serious questions about the adequacy of the reactivity control system as a whole.

CONCLUSION:

Petitioner has shown that a significant number of the reactor's safety features are either inadequate or missing in entirety. The specific features mentioned are those that are known by Petitioner at this stage of the proceeding, prior to discovery and prior to the establishment of a public reading room for this docket. Petitioner contends that sufficient basis has been established to support the contention that safety features generally are lacking and inadequate, but is willing to specify features not detailed above after a public reading room is set up and discovery completed.

The bases presented above demonstrate that Applicant's facility lacks basic safety features necessary to operate the reactor in a manner that will not endanger the public health andsafety. Given the gravity of this matter Applicant has a heavy burden of proof to demonstrate that the lack of adequate safety features will be overcome in the future sufficiently to allow the safe operation of the reactor. Applicant has failed to make such a demonstration, and therefore the application cannot support the issuance of a license.

XII. SPECIAL NUCLEAR MATERIALS LICENSE

The Applicant's equipment, facilities, and procedures for handling and using special nuclear materials are inadequate to protect health and minimize danger to life and property and therefore cannot support the issuance of a license.

Specifically,

1. Applicant does not include an application for a special materials license with their Application for an operating license. 10 CFR 70.22(b) requires that the application contain "a full description of applicant's program for control of an accounting for special nuclear material which will be in Applicant's possession under the license, to show how compliance with the requirements of 70.58 will be accomplished." Neither section 22 or section 58 have been complied with.

2. The little information in the Application that is relevant to the special nuclear materials license is inadequate and does not meet the requirements of the regulations.

a. There is no evidence in the Application that the stored special nuclear materials are monitored for criticality as required by 10 CFR 70.33.

b. Applicant states on page five of the Application that they are applying for a license to use 4700 grams U-235 (irradiated), 4700 grams U-235 (fresh), and Pu-239 and a 2 Curie, Pu-Be neutron source. This description does not meet the requirements of 10 CFR 70.22(4) that they specify "the name, amount, and specifications (including the chemical and physical form and, where applicable, isotopic content) of the special nuclear material..."

3. The general safety, security and operating history of this Applicant suggests that the license for bomb-grade (93% enriched) uranium should not be granted.

a. The quantity of U-235 requested represents 60 percent of that needed for an atomic bomb assuming a sphere of 19 g/cm^3, with 15 cm natural uranium reflector, according to Reviews of Modern Physics: Vol. 50, No. 1, Part II, January 1978, page S28.

The tragi-comic incident involving UCLA's first and only shipment of spent fuel on June 21 of this year further indicates that the Applicant is qualified to handle neither fresh nor spent fuel. (Attachment, Valley News, June 22, 1980). The failure to notify local officials, the inability to keep the shipment secret from media or public, and the failure of the shipment to take the appropriate route (and instead traveling and extra 100 miles through highly populated areas), all indicate that there is a serious health threat to the public if the Applicant is licensed to handle irradiated fuel and a serious proliferation problem if they have fresh fuel. (Valley News, June 22, 1980).

The above indicates that the Applicant has failed to submit an application for a special materials license despite the certification page statement that:

> The applicant or any official executing this certificate on behalf of the applicant certify that these applications are prepared in conformity with Title 10, Code of Federal Regulations, Parts 50 and 70, and so solemnly swear (or affirm) that all information contained herein, including any supplements attached hereto, is true and correct to the best of our knowledge and belief.

Given this failure it is impossible for the Board to issue such a license or to conclude that the Applicant will handle special nuclear materials in such a manner as to protect the public health and to minimize danger to life and property.

UCLA ships nuclear material

By ADAM DAWSON

Background

UCLA's nuclear energy laboratory has been in operation since 1960. Since that time, spent fuel has been stored on the site. Federal approval was granted recently to transfer the material.

The semi-secret shipment of high-level radioactive waste from UCLA's nuclear reactor early Saturday annoyed Los Angeles County health officials who had not been told about the move.

The enriched uranium, far less than needed to construct a bomb, moved from the Westwood campus about 10 a.m., down Wilshire Boulevard and onto first the San Diego and then the Santa Monica freeways on its way to an Idaho Falls facility for chemical reprocessing.

When told of the shipment by a Valley News reporter, Joseph E. Karbus, head of the county's radiation management office, said he should have been informed and promised to contact the Nuclear Regulatory Commission and UCLA Monday to find out why local officials were kept in the dark.

He said the quantity of enriched uranium being shipped was small enough, about two pounds of spent fuel, so that he did not see it as a serious threat to the public, "but anything dealing with a reactor is in the public eye and I would like to be aware of it."

While Karbus said the danger to the public was minimal, he noted there could be some local radiation contamination if the truck carrying the spent fuel had an accident en route and the cask containing the spent fuel broke open.

"There is a certain health hazard associated with the handling of it," said Neill C. Ostrander, manager of UCLA's nuclear engineering lab. He added the amount of enriched uranium contained in the spent fuel plates was far less than the amount needed to construct a bomb.

"This reactor is under NRC direction," Karbus said. "We would look to them to advise us."

Under NRC rules local officials are not required to be notified of shipments of low strategic significance. That rating reflects the amount, not the radiation levels, of the shipment.

Karbus said hundreds of shipments of radioactive material cross Los Angeles County each week although most of them are medical isotopes with low levels of radiation. Such low radiation material can be buried safely, officials said, in contrast to the high-level radioactive waste.

"Enriched uranium certainly has greater significance than normal medical isotopes," Karbus said.

He noted Southern California Edison Co. bypasses Los Angeles County and all heavily popu-

UCLA ships high-level nuclear waste

lated areas when it trucks spent fuel from its San Onofre Nuclear Generating Station south of San Clemente.

Ostrander said he had been advised the NRC would contact the necessary agencies. "I'm sorry to be told he (Karbus) wasn't informed about this."

Regional NRC officials were unavailable for comment.

Daniel [illegible]irsch, of the anti-nuclear [illegible]ttee to Bridge the Gap, [illegible] he was surprised county [illegible] officials would not know about a shipment of spent fuel and a member of the media would.

"It seems to me it should be the other way around," Hirsch said. "If UCLA is this careless with security about a shipment of high-level radioactive waste imagine how lax they might be with an incoming shipment of fuel."

Ostrander said there was plenty of campus security present during the actual loading of the material onto the truck, although once the loading had been completed, and prior to the vehicle's departure, no security was visible.

Radiation from the spent fuel, which Ostrander said had been in dry storage at UCLA for at least the past five years, was measured at two roentgens per hour at one meter. That is equal to 17,520 roentgens a year and the legal limit of exposure for the general public is .5 roentgens (or 500 millirems) per year.

By the time the fuel plates, weighing 35 pounds, were placed inside a cask weighing 32,000 pounds on the back of a long flatbed trailer, UCLA radiation safety officers measured less than .1 of a millirem at one meter.

Karbus said because of the Three Mile Island nuclear accident in Pennsylvania last year, anything that happens to a reactor becomes a public issue and the only way to keep things in perspective is to be informed.

"I think the NRC should have advised us about this," Karbus said.

The spent fuel, weighing a total of 35 pounds, consists of uranium-aluminum plates 26 inches long, 2.5 inches wide and 1/86 of an inch thick, said UCLA's Ostrander.

The plates in five bundles of 11 were the first shipment of spent fuel from the UCLA reactor in the 20 years it has been operational.

XIII. INHERENT PROBLEMS IN ARGONAUT TYPE REACTORS

Problems inherent in the design of Argonaut type reactors have been identified at other Argonaut reactor facilities, and until Applicant has demonstrated that these problems have been adequately resolved at UCLA, the Applicant cannot assume that the operation of the reactor will not be inimical to the public health and safety.

Specifically,

1. Graphite Temperature Coefficient: The UCLA reactor is graphite moderated. The positive temperature coefficient of graphite increases the likelihood of a reactor runaway and decreases the effectiveness of the reactor's self-limiting features.

a. "A report to the Commission by the University of Washington (letter to D.J.Skovholt from A.L. Babb, dated January 4, 1968) [notes] a positive graphite temperature coefficient which [was found] during operation of the University of Washington Argonaut reactor." ...

" [UCLA] attempted unsuccessfully to measure the affect of graphite heating in the UCLA reactor". ...

"However, during the review of the console logbook, the inspector noted that several, three to four hour, reactor operating periods at 100 kw had been performed. By reference to the console logbook and the temperature of the water moderator, it appears that a positive graphite temperature of 0.006% $\Delta k/k/°F$ exists."

- W.E.Vetter Report at Inspection CO Report No 50-142/68-1, page 6.

b. There is no information included in the application or otherwise presently available to Petitioner which indicates that Applicant has experimentally determined the coefficient or made any changes in their operation to compensate for the effect of heat on graphite.

2. Control Rod Motors: Other Argonaut facilities have experienced control rod motor problems, and therefore UCLA should have replacement

motors on site.

a. "Further inquiry was made regarding replacement regulating rod drive motors (Reference: 11/20/72 memo Keppler to Spencer regarding rod drive motor problems experienced at University of Florida). UCLA does not have any replacement motors."
- Memo from G.S. Spencer to H.G. Thornburg regarding April 3-5, 1973 inspection at UCLA; dated: April 24, 1973.

b. There is no information included in the Application or otherwise presently available to Petitioner which indicates that Applicant has procurred replacement motors or taken other steps to guard against motor failures.

3. Water Pressure Problems: The University of Florida has experienced water pressure problems in the coolant system because the system is supplied by the city water main. UCLA reactor coolant system is also supplied from the city water supply and should have a pressure compensation system installed.

a. "The nuclear reactor at the University of Florida has a problem - - the cooling system malfunctions when someone flushes the toilet... [L]ow risk experiments run on a secondary cooling system tied in by a city water main to the toilet. Untimely flushes have caused the reactor to be shut down five times in the past three years sending students' experiments down the drain."

- Washington Post: August 19, 1977

The above indicates that Argonaut reactors have certain operating problems inherent in their design. However, Applicant has failed to identify these problems or their resolution in their application. Given this failure, it is impossible to conclude that the reactor will be operated in a manner which avoids these inherent problems and will not endanger the public health and safety.

XIV SITING

The site characteristics of this reactor such as population density and seismic activity are such, and have changed sufficiently over the period of the first license, that the reactor cannot be operated in such a manner as to assure that the public health and safety will be protected.

1. Increased population density. The population density immediately surrounding the reactor and in the general vicinity have increased to such a degree it is no longer safe to operat the reactor in this facility at this site.

a. Since the reactor building was built as a self-contained structure the facility has been surrounded on all sides by new construction, including classroom facilities directly above the reactor and directly adjacent to it.

b. The main air-conditioning intake manifold for one of these classroom structures, the Math Science Building, is located less that 100 feet directly upwind of the reactor exhaust stack.

c. The student population of the campus has increased to 30,000 during the licensed period with at least a proportionate increase in staff, employees and others.

d. More than one half million people live within a five mile radius of the reactor with over two million people living within a ten mile radius. These population figures represent a 13% increase over the past decade, a level of increase that will probably continue for several years. (See the Application, page III/3--3)

2. <u>10 CFR 100 Siting Criteria</u>. This reactor without a containment structure and being surrounded by such a dense population can potentially expose the public to levels of radiation far in excess of the guidelines set forth in 10 CFR 100 or by any standard necessary to protect the public health and safety.

a. The reactor has no air tight containment structure.

b. In the Applicant's Safety Analysis report they state that the exposure to the thyroid of a person within fifteen meters downwind from a reactor building leak would be 1800 rems in an eight hour period. Application, page III/B-6. This level of exposure is six times the exposure allowed by the guidelines set forth in 10 CFR 100.11 (a) (1), (2), for exclusion areas and low population zones. Given the fact a reactor leak could occur into the adjacent buildings and their environmental control systems, hundreds of people could be exposed to excessive doses of radiation.

3. <u>Seismic Vulnerability</u>. The reactor is sited in a seismically active area and in the last twenty years has been damaged by seismic activity. Therefore, given the other characteristics of the site, in the event of a major earthquake the reactor would endanger the public health and safety.

a. The reactor is sited in an area where earthquake intensity can be expected to reach levels of intensity of VIII and higher on the Modified Mercalli Intensity Scale. Nero: A Guidebook to Nuclear Reactors, Pg. 57 , (1979).

b. The earthquake of February 1971 caused enough damage to the reactor to require shutdown for a major maintenance effort. 1976 Annual Report page 3.

c. In 1968 the reactor staff conducted an earthquake simulation test. The results of the test as reported in Nuclear Applications and Technology, Vol. 7, July 1969, entitled "Vibration Testing and Earthquake Response of Nuclear Reactors: Criag B. Smith and R. B. Mathiesen of NEL.

> "Aboutsix months after the vibration experiment routine tests indicated that one of the control blade insertion times had increased. A few months later safety blade No. 6 stuck in the out position during a routing pre-start check-out of the reactor control system. When the reactor was dismantled, we discovered that lead shielding bricks had been displaced upward, causing the shaft to bind.
>
> Vibration Testing, Page 23-24

The above bases indicate that the reactor was built at a time when the population surrounding the reactor was much less dense and much less proximately located to the reactor. The demographic changes that have occurred over the past twenty years prevent this reactor from being safely operated over the next twenty years.

XV. REACTOR IS TOO OLD

The reactor in question is so old that it poses an unacceptable hazard should it be relicensed, particularly for a twenty-year period. The key equipment is already so aged as to be unreliable and other equipment is antiquated and outdated. Because of the age of the reactor it is very difficult to obtain spare parts and key safety features required of newer facilities are lacking in this facility. The reactor is thus too old to function safely and reliably now, let alone at the beginning of the next century.

Specifically,

1. The reactor was built in the late 1950's by a company that shortly thereafter went out of the business of building reactors. The company in question (AMF, which merged with Voit Company) now primarily makes basketballs, swimfins, and other sports equipment. The fact that the reactor vendor is no longer in the business of building reactors has hampered proper maintenance and significantly reduced the safety of the reactor, in large part due to the difficulty in obtaining spare parts.

2. The age of the reactor makes instrumentation unreliable, difficult to repair and hard to find spare parts for. In his Annual Report about the UCLA Nuclear Energy Lab, Professor Ivan Catton, NEL Director, wrote:

> Some of the reactor instrumentation is still workable, but sometimes unreliable, and is very difficult to repair due to its age and the resultant problem of obtaining parts (e.g. vacuum tubes, specialized switches, indicators, and meters).

3. Much equipment is outdated and, because the Applicant does not have the financial means to update it, this equipment is only likely to get worse. Professor Catton:

> If the NEL receives extra funds, the orderly updating of sonsole instrumentation will proceed...

> If money is found, our antiquated activation analysis laboratory must be modernized. It is currently about 10 years behind the state of the art.
>
> 1976 Annual Report, page 35-36.

4. The reactor was build before features such as containment vessels and Emergency Core Cooling Systems were realized to be important safety features. In a November 5, 1975 letter to the NRC's Karl Goller, William Kastenberg, then lab director, wrote:

> The biological shield is stepped and reasonably well designed to eliminate streaming radiation, it was not designed as a containment vessel. (emphasis added)
>
> page 4.

5. The reactor was built before the problem of Argon-41 production with such reactors was recognized. The Kastenberg letter, cited above:

> The UCLA reactor was designed and built before the irradiation and diffusion of interstitial air (with argon 41) became a recognized problem.
>
> Kastenberg letter, 11/5/75, page 4.

6. Age has severely reduced the usefulness of the facility. Professor Catton's 1976 report, page 3:

> The reactor is no longer new, and reactor physics projects with the UCLA reactor have become non-existent.

The UCLA reactor is so old that it cannot be operated safely and reliably. The reactor was built prior to the development of modern safety features and lacks these features. The existing equipment is dangerous due to age, antiquated design and the difficulty of obtaining replacement parts. The reactor therefore cannot be operated safely and reliably over the twenty year license period.

XVI. SEISMIC VULNERABILITY

The facility for which the license has been requested is inadequately protected from seismic activity. Furthermore, there is a basis for concern that the facility is vulnerable to seismic activity and its location is one of the most seismically active regions of the country. The reactor therefore poses a serious threat to public health and safety.

Specifically,

1. Applicant has omitted key information from the Application regarding seismic vulnerability.

a. Applicant claims on page 7 of the Application:

> No structural weakness (earthquake vulnerability) has ever been identified.

However, page three of the 1976 Annual Report by Professor Catton states:

> The February 1971 earthquake gave rise to minor problems that worsened with time and ultimately required a major maintenance effort in 1972.

b. Application on page II/3-1 states:

> The UCLA Reactor has been subjected to experimental vibration. The results were reported by C.B. Smith at the Winter meeting of the American Nuclear Society, November, 1968, in a paper titled "Vibration Testing and Earthquake Response of Nuclear Reactors."

However, Applicant neglects to include the results of that experimental vibration - - significant shifting of the core causing sticking of a control blade in the out position requiring dismantling of the core. The paper cited in the Application states the following:

> About 6 months after the vibration experiment routine tests indicated that one of the control blade insertion times had increased. A few months later safety blade No. 1 stuck in the "out" position during a routine prestart checkout of the reactor control system. When

> the reactor was dismantled, we discovered that lead shielding bricks under the control blade drive shaft had been displaced upward, causing the shaft to bind. page 24.

This failure is confirmed by AEC inspection report 50-142/68-2, which stated that the pinning of the control blade was caused by shifting of lead shot inside the reactor core:

> caused by, or at least aggravated by, an experiment during the previous year to determine the effect of earthquakes on reactor operations. During this experiment, the reactor superstructure and core were subjected to relatively severe shaking. page 7-8.

Furthermore, the Application did not mention an October 1966 shake test corresponding to "an earthquake of light to moderate intensity", about "a magnitude of 4" that indicated a power oscillation during the shake test and also a 1968 simulation of effects of vibration in a fuel bundle confirming that such power oscillations can result from fuel bundle vibrations changing fuel spacing. ("Simulation of Earthquake-Induced Vibrations in a UCLA Reactor Fuel Bundle" by R.L. Rudman, 1968; and "Simulation of Earthquake Effects on the UCLA Reactor Using Structural Vibrators" by R.B. Matthiesen and C.B. Smith). A review of the results of all three studies - - and any others that might exist - - seems in order.

2. Failure to Consider New Data

a. The Application simply repeats the language of the 1960 Hazards Analysis when it states that the reactor was built "according to the accumulated wisdom of the Uniform Building Code" in effect in the late fifties when it was built. We question whether the Uniform Building Code then in effect is sufficient for a nuclear reactor today; certainly Applicant should have reviewed the facility against current standards. In addition, new data (for example, the results of the Imperial Valley earthquake of 1979 which damaged the services building of the County despite the fact that the earthquake had a peak magnitude of 6.6 on the Richter scale and the building was supposedly engineered to withstand an earthquake of magnitude 8." See "'Earthquake-Resistant' Buildings" by R. Berger, Science, February 1, 1980) should have been considered. It is important to note that at least two of the earthquake simulation tests to which the UCLA reactor or fuel were subjected were only representative of an earthquake of a magnitude of 4 - - several orders of magnitude below what could occur in the area.

b. In addition, the Applicant has failed to report that it has been discovered that four UCLA buildings don't meet earthquake standards and that the University architects were -- as of April 1980 -- conducting a study of buildings on a UC campuses to rank them according to their need for seismic renovation, according to the UCLA Daily Bruin, April 30, 1980. Surely the results of that study should be taken into account.

c. A review of the experience of other Argonaut or test reactors during earthquakes was not done and would be in order.

d. The Application merely restates the language of the 1960 Hazards Analysis regarding site seismology. Surely there is new information available in the twenty years since the initial report was written. As has been shown elsewhere in these contentions, the claim that there are no wells in the area is not true; what other language from that 1960 report that was just retyped for this application is also untrue? A thorough review is in order.

3. Possible Earthquake Hazards Not Analyzed

a. Possibility that in an earthquake, the supports in the void area between the third and fifth floor of Boelter, directly above the reactor, could be damaged, causing floors five and above to come crashing down onto the roof of the reactor. The acceleration of so much mass through two stories, landing on the roof of the reactor, could easily crash through that roof, massively damaging the reactor core below. This could result in broken fuel bundles and a release of significant amounts of fission products.

b. Earthquake causing vibration of the fuel bundles, changing spacing and creating potentially hazardous power oscillation.

c. Earthquake causing control blades to stick as the moderate shaking did previously.

d. Earthquake shifting a "secured" experiment of significant reactivity; or breaking open the pneumatic tube and dispersing its contents inside the reactor; or causing pipe breaks or other leaks involving possible radiation exposure.

e. Initiation of criticality in stored fuel -- fresh or spent.

f. Earthquake initiating a steam explosion, disassembling core.

g. Earthquake causing significant core damage without upper floors crashing through the roof of the reactor.

h. other potential hazards from earthquakes that would be apparent if and when a full disclosure of relevant seismic studies and data and calculations are made.

The reactor is situated in an area of major seismic activity; in the absence of a containment structure and in the midst of a populated building and campus and community, a thorough review of potential seismic problems is essential. Applicant made no such review in the Application. In fact, the few statements made about seismic issues in the application were misleading at best. In the absence of a thorough review of the potential for damage from seismic activity, the Applicant cannot be said to have fulfilled its burden of demonstrating adequate protection against such damage.

VIBRATION TESTING AND EARTHQUAKE RESPONSE OF NUCLEAR REACTORS

REACTOR SITING

KEYWORDS: reactors, reactor safety, vibrations, testing, seismology, research reactors, mathematics, sensitivity, stability, analysis, motion, earthquakes, UCLA, EGCR, CVTR

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Vibration testing of nuclear reactors is discussed as a part of the determination of the response of such systems to earthquakes. The basic theory of vibration testing is presented along with a comparison of impulse, ambient, and steady-state testing. Steady-state tests provide a method of obtaining the complete dynamic characteristics of a system and of selectively studying each of the components of the system; e.g., containment, steam generator, pressure vessel, instrumentation, etc. Generally, both impulse and ambient studies do not provide as much detailed information while being less time consuming and creating less interference with other operations.

A series of tests performed on the UCLA research reactor, the Carolinas-Virginia Tube Reactor, and the Experimental Gas-cooled Reactor at Oak Ridge are used to illustrate results obtained with steady-state tests. These illustrate the effect of the vibrations on instrumentation as well as the response of the reactor cores, fuel elements, biological shielding, steam generators, exhaust stacks, and the containment structures. The tests of the UCLA reactor included tests with the reactor at full power. The examples illustrate the complexity of the soil-structure-reactor system while also indicating the nature of the results which may be obtained with vibration tests.

INTRODUCTION

Knowledge of the effects of earthquakes on nuclear reactor safety will be increasingly important as more nuclear power plants are constructed in seismic regions. Until the time when we have experienced the actual behavior of large power reactors in strong motion earthquakes, it will be necessary to predict their performance with studies based on simulations and analysis.

To discuss vibration testing of nuclear reactor systems, one needs to consider the use that will be made of the tests. The obvious use is to determine the dynamic response of key reactor systems. We believe that this is important, but it is also important to use the test results to check the validity of mathematical models of structures. There is considerable need for analytical models that will accurately predict the response of large nuclear power plants to the vibration effects of earthquakes.

Much work has been done in the fields of seismology and earthquake engineering, and we believe that it is possible today to construct a "first approximation" to a complete analytical model. We are surveying this work and are attempting to draw it together to construct an overall model. Where possible, we plan to use our own experimental work or the work of others to verify the model.

In addition, we expect that the experimental work we have done will indicate areas, if any, where nuclear power plant design requires further research and development. Once a complete analytical representation of the earthquake-soil-structure nuclear reactor system is available, it will be possible to study the sensitivity of the model to variations of its parameters. Sensitivity analyses can pinpoint areas in the system where additional research is required or where additional research would lead to significant improvements in the stability or safety of the system.

In this paper we discuss some analytical models and several experimental techniques for testing reactor structures. We compare the advantages and disadvantages of the several testing techniques, based on our experience in the field

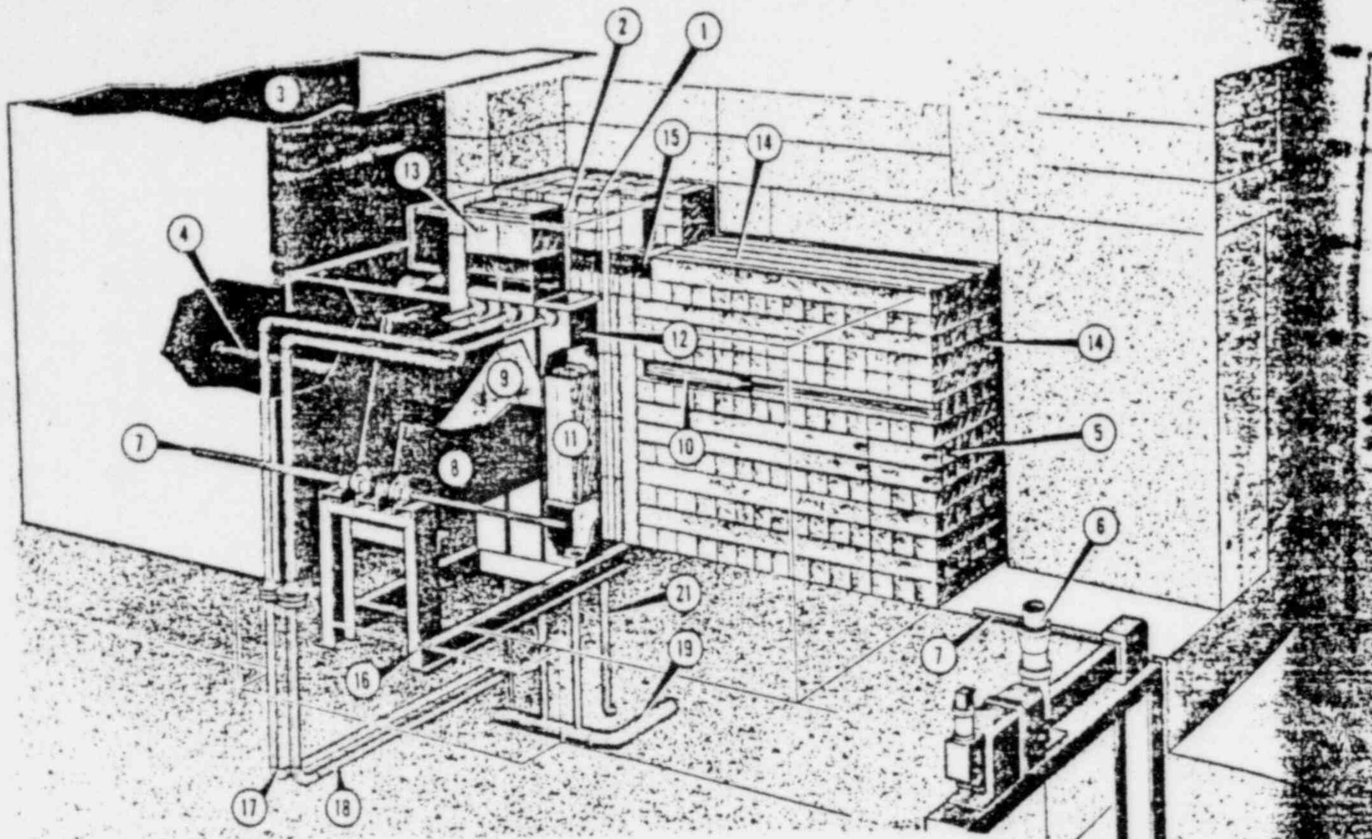

Fig. 19. UCLA reactor-core area.

None were observed. About 6 months after the vibration experiment routine tests indicated that one of the control blade insertion times had increased. A few months later safety blade No. 1 stuck in the "out" position during a routine prestart checkout of the reactor control system.

When the reactor was dismantled, we discovered that lead shielding bricks under the control blade drive shaft had been displaced upward, causing the shaft to bind. The lead shield blocks were stacked on lead shot which had been poured in the void spaces between the graphite and biological shield. Subsequently the lead shot has been canned in steel containers, and a steel shroud has been welded in place to protect the drive shaft from interference.

The response of the EGCR core (Figs. 22 through 24) is interesting. The acceleration curves (north-south shaking) for both the center of the graphite columns and the top grid plate show peaks, one at ~3.9 cps and another at 4.2 cps. forced vibration tests reveal that the peak 4.2 cps is the primary response of the build the 3.9-cps response is due to the core its When the shaking direction is switched to E the grid plate has a sharp peak at 4.6 cps, wh is equal to the natural frequency of the building the east-west direction.

Figure 25 shows another interesting aspect EGCR core response. The grid plate resp indicates the unstable jump phenomenon asso ated with a nonlinear softening spring. As frequency of the forced vibrations increases, amplitude of accelerations increases uniform 8.87 cps. At 8.90 cps, the amplitude nearly bles, and then falls off at higher frequency. W the forced vibration frequency is lowered. acceleration amplitude retraces the same cu

XVII. INADEQUATE FINANCIAL QUALIFICATIONS

The Applicant does not possess, and cannot give reasonable assurance of obtaining funds sufficient to cover the costs of operating the facility over the twenty year license period plus the cost of permanently shutting the facility down and maintaining it in a safe condition. Given this lack of assurance Applicant fails to qualify financially for an operating license.

1. Deferred Maintenance. Applicant has, in the past, neglected or postponed the repair and improvement of safety instruments and systems, due to lack of funds. These financial difficulties indicate that Applicant must make a strong showing that in the future they will obtain sufficient funds to maintain and operate the reactor.

a. On March 13, 1975, Thomas Hicks, then Director of NEL, in response to violations cited in NRC Inspection report no. 050-142/75-01, proposed to replace an exhaust fan moter and add footage to the exhaust stack. In the March 13th letter Hicks stated:

> "The cost of bringing the ventilation system to conformance with the Technical Specifications will be substantial and beyond the means of the Nuclear Energy Laboratory or the School of Engineering and Applied Science. The School of Engineering and Applied Science is currently seeking University support for the revision and hopes to accomplish the work within 6 to 9 months." (emphasis added)
>
> March 13, 1975 Letter by Thomas Hicks to NRC

The NRC Inspection and Enforcement Division found this an "unacceptable response" in part beacuase of the delay caused by the lack of funding and convened an Enforcement Conference in Walnut Creek with the Applicant. (See Memo to File by: F.A. Wenslawski, on Enforcement Conference and Subsequent Actions, UCLA, Dcoket no. 50-142, April 30, 1975)

b. Applicant, despite the knowledge that the highest likely radiation exposure to the public would occur within the adjacent Math Science building has never directly measured the Argon-41 concentrations within that building. A masters thesis by Mark P. Rubin in 1976 done in connection with NEL indicates that direct measurement was not done for financial reasons:

> "... some method of radioactive decay analysis is the only way to achieve the sensitivity necessary (to measure the Argon)... However, the required systems were not available at UCLA and building them would run into thousands of dollars for the ion chambers, and tens of thousands of dollars for a scintillation system. Since virtually no funding existed for this research, finances seemed to preclude the development of the required radioactive decay detection system."
>
> Rubin: Atmospheric Dispersion of Argon-41 from the UCLA Nuclear Reactor, pg.3-4 (1976)

c. In 1975 Applicant determined that a decay tank capable of reducing the Argon-41 emmissions could be built for about $1,000.00. These tanks have not been installed.

> Letter from William E. Kastenberg, Reactor Director to Karl Goller, NRC; November 5, 1975, pg.5-6.

d. Applicant has admitted that needed updating of the reactor's aging equipment has suffered because of a lack of funds:

> "If the NEL receives extra funds, the orderly updating of console instrumentation will proceed. Some of the reactor instrumentation is still workable, but sometimes unreliable, and is very difficult to repair due to its age and the resultant problem of obtaining parts.
>
> UCLA NEL Annual Report: 1976, pg 35.

e. The Applicant has failed to carry out other relatively inexpensive safety improvements recommended over the past several years, such as extending the stack height and installing a fence around the stack area, (See Study for UCLA done by Applied Nucleonics: Atmospheric Dispersion Analysis of Argon-41 Discharges from the UCLA-NEL Nuclear Reactor, (February, 1975)) which recommended that raising the stack height would significantly reduce public exposure.

The littany of failures to repair, maintain, and calibrate equipment, and the failure to conduct reasonable amounts of monitoring and systems checking set forth in other contentions all suggest that the Applicant does not have sufficient funds at its disposal to adequately and safely operate the reactor.

2. Political Funding. Applicant, because it is part of a public institution and subject to funding on a yearly basis cannot assure that it will be able to obtain sufficient funding for operation or decommission over the license period.

a. Applicant states in its application that its funding levels are "Subject to the availability of funds from the State of California, continuing positive recommendation by the faculty, and continuing programmatic need . . ." Application page I/1-1

b. The continuing programmatic need for the antiquated reactor is questionable. In the 1976 Annual Report Professor Catton stated: "The reactor is no longer new, and reactor physics projects with the UCLA reactor have become non-existent". (Annual Report 1976 pg 3); See also other contentions dealing with the antiquation of the reactor and lack of research projects.

c. If the reactor is antiquated and lacking in utility in 1980, and will become more expensive to maintain as its age increases on what basis will the University justify appropriating money for its operation in the year 2000?

3. Decommissioning Expense. A ~~licant has made no provisions to assure that they will be able to obtain the funds for the $754,000.00 (1980 dollars) cost of decommissioning the reactor. An expense equal to over five times the annual University appropriation for the NEL.

The reactor operation has had financial difficulty in the past. In the future it faces increased maintenance costs associated with age and the enormous cost of decommissioning. These factors when balanced against the political nature of the NEL funding suggest that Applicant cannot reasonably make the financial assurances necessary to support the issuance of a twenty year license.

XVIII FAILURE TO ADEQUATELY EXAMINE MAXIMUM CREDIBLE ACCIDENT FOR THIS REACTOR

Because of the placement of this reactor in a crowded building on a highly populated campus in a highly populated urban area, and because of the lack of a containment structure to effectively isolate fission products that might be released in an accident, and because the reactor is operated at times in an instructional and training situation, it is essential that a thorough analysis be conducted of various possible scenarios by which a major accident might occur.

The only attempt in the application to do this, that of the 20-year-old xeroxed section of the Hazards Analysis from 1960 dealing with excess reactivity insertions, is the subject of thorough review in the contention regarding excess reactivity. Its inadequacies are quite clear.

No other attempt has been made in the Application to deal with the question of the maximum credible accident for this facility. Among the scenarios that should be examined thoroughly if an adequate application were prepared would be the nature of maximum potential damage that could be caused by

1. earthquake
   a. damaging core, breaking open fuel, releasing fission products
2. sabotage
   a. from inside
   b. from some person or group outside
3. reactor runaway

4. plane crash into reactor building
5. multiple failure modes
6. maximum potential operator error
7. Other failure modes that can best be determined by Applicant or after discovery.

This reactor need not have damage of the fuel meat itself to release significant fission products. Any damage to the cladding is a potentially serious release of fission products directly to a highly populated area. Scenarios by which that cladding damage could occur are essential for a thorough safety analysis and for a basis for the assertion by the Applicant that the license can be granted without undue risk to the public. Given the gravity of potential results if the Applicant is not worthy of licensing and nonetheless is able to continue operating this facility, a substantial burden rests with Applicant to consider ways in which serious accidents could occur in order to provide a basis for an accurate assessment of their likelihood and consequences. In the absence of such information, license cannot be granted without an undue threat to public health and safety.

IV PHYSICAL SECURITY PLAN

Applicant's Physical Security Plan is inadequate and fails to meet the requirements set forth in 10 CFR 50.34(c). This contention is based on the fact that, while Petitioner has been unable to examine the security plan at this point in the proceeding, the general lack of attention shown to regulatory requirements in the rest of the application, and the history of lax security practices at the facility, strongly suggest the security plan is inadequate. Until Petitioner is admitted as an intervenor and given the opportunity to examine the plan, Petitioner cannot possibly make this contention more specific. Therefore, Petitioner requests admission on this contention, with the understanding that specific contentions regarding the security plan will be submitted at the close of discovery.

a. The events surrounding the shipment of high level wastes on June 21, 1980 is one example of lax security practices. The security during this operation was virtually non-existent. No security was visible between the loading and the departure. The month of the shipment was published in the application to relicense. No security car followed the truck as it left UCLA. Furthermore, the Applicant failed to notify the local authorities that the shipment was to take place.(See Article, Valley News, June 22, 1980).

b. Applicant has a history of inviting and allowing unlicensed and unqualified persons to operate the reactor. (See contention on managerial and administrative controls for detailed discussion).

XX. EMERGENCY RESPONSE PLAN

Petitioner contends that Applicant's Emergency Response Plan is insufficient to demonstrate that the plan provides reasonable assurance that appropriate measures can and will be taken in the event of an emergency to protect public health and safety and prevent damage to property. Given this insufficiency Applicant's Emergency Response cannot support the issuance of an operating license.

1. The prohibition in the plan that no non-university individuals be contacted until instructions to do so come from Campus police entails an unnecessary and unreasonable delay in placing non-University emergency response personnel on alert. Plan § 1.2.12-14

2. The requirement in the Plan that evacuation of Boelter Hall and Math Sciences addition be cleared through the vice-chancellor's office entails an unreasonable and unnecessary delay in evacuating these facilities since both facilities are directly adjacent to or surrounding the reactor facility and have air-conditioning/heating systems that could be contaminated immediately. Plan § 1.2.13

3. The Plan does not adequately provide for alternative personnel with the authority to make initial evacuation decisions in the event that the vice-chancellor's office is unable to respond.

4. The Plan does not provide for alternative personnel to carry out the role of the Health Physicist, as general director and supervisor of the emergency response, in the event that the Health Physicist is unavailable.

5. Applicant does not have adequate measuring devices to accurately determine the extent and seriousness of an accident .

a. (See contention on inadequate monitoring systems).

6. The Plan has no provisions indicating that there is an evacuation plan for the entire campus which could be successfully implemented in the event of an emergency.

7. The Plan does not provide for any emergency centers other than the UCLA Medical Center, despite the fact that the Medical Center is no more than one quarter of a mile away from the reactor. In the event that there was a serious accident and the wind was blowing in the direction of the Medical Center, it would be unusable as an emergency center.

8. The Plan lists available equipment and the locations at which such equipment is available. However, the Plan fails to indicate which equipment and in what quantities it is available for each location. Plan §§ 2.1,2.2

9. The Plan will only be effective in the event of an acutal emergency if the annual training excercises and drills set forth in the Plan have actually been carried out. Petitioner wishes to reserve the right to further specific contentions in this area until the close of discovery, because they have no way of gathering such information at this point in the proceedings.

XXI SAFEGUARDS CONTINGENCY PLAN

Petitioner contends that the Applicant has not submitted a safeguards contingency plan as part of their application and therefore the Plan is inadequate and cannot support the issuance of a license. The plan must at a minimum include, the four factors set forth in 10 CFR 50.34(c); Background, Generic Planning Base, License Planning Base, and Responsibility Matrix. None of these items appear in the application. If the Applicant contends that the safeguards contingency plan requirements have been met in the contents of the physical security plan the Petitioner must contend also that the plan is inadequate to protect the public health and safety. This contention is based on the fact that although Petititioner has not had an opportunity at this stage of the proceedings to examine the physical security plan, the generally inadequate nature of the application and the past history of lax security practices suggest that the plan will also be inadequate. If the plan is incldued in the Physical Security Plan, Petititoner contends that the Board must admit this contention for the purpose of discovery with the understanding that Petitioner must submit specific contentions regarding the safeguards contingency plan at the close of discovery.

XXII. TECHNICAL SPECIFICATION INADEQUATE

The Technical Specifications included in the Application contain provisions which unacceptably reduce safety standards and pose a threat to public health and safety; numerous substantial changes have been made in the Technical Specifications without so describing in the introduction.

1. Change in excess reactivity limits The current Technical Specifications limit excess reactivity to 2.3 percent $\Delta k/k$; the new Technical Specifications describe the limit as \$3.54, apparently using a β of .0065. The Hazards Analysis give a β of .0074. Elsewhere in the Application β is described as .0068 and .0070. If any of these three other β's are correct, the transposition of excess reactivity from 2.3 percent to \$3.54 is an unapproved increase in reactivity. Furthur, the Technical Specifications do not say at what temperature -- 32°F or room temperature -- the new \$3.54 limit is defined.

2. New definition for "annual" in calibration requirements: The old Technical Specifications define "annual" and discuss calibration schedules as every 12 months, the normal definition. The new Technical Specifications (p. V/3-3) define annual as every 14 months. This is an unwarranted lengthening of the permitted time between calibrations.

3. Removal of requirement to do a heat-balance--nuclear instrumentation calibration. The removal of this calibration can have significant safety impact; if core power instrumentation is not independently and accurately calibrated, trip levels can be off and indications necessary to avoid overshooting and improperly compensating for inaccurately detected power level changes can create a very unsafe situation. It is an important calibration to keep doing.

4. Removal of requirement that ALARA be met. The old Technical Specifications require the facility to meet ALARA standards. The new Technical Specifications have removed that language. Furthermore, the discussion about ALARA is repleat with erroneous conclusions and statements (see contentions on emissions for details); in particular, Applicant cannot take credit for meeting ALARA now with plans for something Applicant intends to do later (i.e. the installation of decay tanks , particularly since this installation has been tied to an increase in operating time in the Applicant's statements and thus to an increase in the production of Argon. The references to 500 mr are irrelevant to a discussion of ALARA; 500 mr is MPD, ALARA is generally defined as one percent of MPD.

5. Removal of specifications regarding height of exhaust stack, flow rate out of exhaust stack and no mention of restricted area on roof. The cover letter to the Application by Dr. Walter Wegst of UCLA states that "This application contains only minor changes (listed in the forward to appendix 5) from the original application." That forward states (page V/i):

> The Technical Specifications contained in this appendix, embody the earlier Technical Specifications (of 1971 as amended in 1976), in revised format and expanded content. With four exceptions noted below, no attempt has been made to alter the content and provisions of the earlier Technical Specifications, and any other discrepancies should be interpreted as typographical errors or editorial deficiencies.

Without attempting to judge the cause of the alterations of the Technical Specifications -- whether by attempts or by typographical or editorial error -- nonetheless significant changes have been made that are not reported in that forward.

XXIII. PROCEDURAL CONTENTIONS

1. Consolidation of proposed changes to the reactor facility with the licensing process.

Applicant has made it clear in the Application, in newspaper articles, and elsewhere that it wishes to increase operating hours and power. In fact, Applicant has stated that the proposal to increase power will be submitted to the NRC by Sept ember 1, 1980.

Any significant change in the operating hours or power will have a major impact on the issues and questions before the Board in the licensing proceeding. Consequently, exlusion of imminent changes from the process will undermine the legitimacy of the proceeding, unduly burden the Board with subsequent duplicative hearings and work against the interest of public participation in the licensing process. Therefore, Petitioner contends that the proposed changes in power and hours be consolidated with this relicensing process.

2. A twenty year license period is excessive considering the present age condition and design of this reactor. Petitioner, contends that the license period be shortened.

August 25, 1980
DATED

Daniel Hirsch
SIGNED

Daniel Hirsch
1637 Butler Street
Los Angeles, CA 90025

President: Campus Committee
To Bridge the Gap

DECLARATION OF SERVICE BY MAIL

On the 25 day of August 1980, I have served copies of the foregoing COMMITTEE TO BRIDGE THE GAP'S SUPPLEMENTAL CONTENTIONS TO PETITION FOR LEAVE TO INTERVENE, by mailing them through the United States mails, first class postage prepaid, on each of the following:

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Office of the Executive Legal Director
Attention: Mr. Joseph Gray
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Dated: 8/25/80

By: [signature]