JOHN H. BAY
DOROTHY THOMPSON
NUCLEAR LAW CENTER
6300 Wilshire Blvd., Suite 1200
Los Angeles, California 90048
Telephone: (415) 393-9234
(213) 653-3973
Attorneys for Intervenor (Contention XX)
Committee to Bridge the Gap

UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

IN THE MATTER OF	)	
	)	Doc. No. 50-142 OL
THE REGENTS OF THE UNIVERSITY	)	
OF CALIFORNIA	)	(Proposed Renewal
	)	of Facility
(UCLA Research Reactor)	)	License No. R-71)

INTERVENOR BRIDGE THE GAP'S RESPONSE TO NRC STAFF'S MOTION FOR SUMMARY DISPOSITION AS TO THE ISSUE OF THE APPLICABILITY OF 10 CFR 73.60 AND THE NEED TO PROTECT AGAINST SABOTAGE

On March 20, 1981, the Licensing Board ruled that intervention by Committee to Bridge The Gap ("BTG") was appropriate on the issue of adequacy of the Applicant's proposed physical security plan and actual physical security at its facility. Intervenor contends that the proposed security plan and security measures at the facility do not comply with the guidelines and regulations applicable to the Applicant's proposed license activities. On April 13, 1981 the NRC Staff moved for summary disposition on the entire matter of Applicant's fixed site physical security ("Staff's Motion"). On July 26, 1982 the

Board, in an attempt to expedite the hearing process, requested an initial response by BTG to Staff's motion, limited to the issues of whether Applicant must protect against readiological sabotage and whether Applicant must meet the requirements of 10 CFR § 73.60. Pursuant to the Board's request BTG submits the following response.

I.

INTRODUCTION

Applicant is seeking a twenty year renewal of its operating license and seeking a license to possess 4700 grams of 93% enriched fresh U-235, 4700 grams of 93% enriched irradiated U-235 and a 32 gram (2 curie) Pu-239 Neutron source. The NRC staff in its Motion for Summary Disposition on Contention XX asserts that despite the fact that Applicant is seeking a license for bomb-grade Special Nuclear Material (SNM), it is not required to protect its facility against radiological sabotage. This assertion not only has frightening implications for a facility located in the center of a major university campus, but is totally contrary to the provisions of the Code of Federal Regulations which require all licensees to protect against radiological sabotage.

The NRC Staff asserts in its Motion that Applicant is not required to meet the physical security requirements of 10 CFR § 73.60 for licensees possessing formula quantities of SNM. This assertion is based on the quantity of SNM allegedly possessed by Applicant and the self-protection qualities of the irradiated U-235 in the reactor core. However, for virtually the entire period of the last ten years Applicant has been in possession of formula quantities of SNM without having an adequate security plan. Applicant is still in possession of a formula quantity of SNM despite its recent off-site shipment of SNM. And Applicant's reactor operation is physically incapable of sustaining self-protecting conditions for the irradiated SNM in the reactor core.

Finally, Staff's Motion also asserts that as a matter of law, Applicant has met the requirements of 10 CFR § 73.67. While the Board has not requested a response to this assertion and BTG does not make such a response herein, BTG does contend that there are clear issues of fact concerning Applicant's compliance wth 10 CFR § 73.67 which will not be obviated by the disposition of this limited response. BTG will respond accordingly regarding these issues at such time as the Board so directs.

In sum, BTG will show: First, that Applicant must protect against radiological sabotage; Second, that Applicant is seeking a license for formula quantities of SNM; Third, that Applicant currently possesses a formula quantity of SNM; and Fourth, that according to Applicant's own calculations, its reactor operation is physically incapable of maintaining the radiation levels of the core fuel high enough to qualify it for the self-protection exemption from the requirements of 10 CFR § 73.60. Therefore, Applicant must either have a security plan which meets the requirements at 10 CFR § 73.60 or its authorized possession of SNM must be limited to less than 5000 grams total SNM whether or not irradiated.

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For these reasons, and because Staff has not demonstrated as a matter of law that it is entitled to summary disposition on these issues Staff's motion should be denied.

II

10 C.F.R. § 73.40 REQUIRES APPLICANT TO PROVIDE PHYSICAL PROTECTION AGAINST RADIOLOGICAL SABOTAGE

The NRC Staff has overlooked the sabotage protection requirements of 10 CFR § 73.40. In their Motion they assert that 10 CFR § 73.67 contains no requirement for protection against sabotage, but only requires early detection and assessment of unauthorized access or activities and therefore Applicant's security plan need not protect against sabotage. Staff Motion, p. 11. However, it is not necessary to reach the question of the requirements of 10 CFR § 73.67 in order to resolve the sabotage protection issue. The requirements of 10 CFR § 73.40 are clear and unequivocal on this point:

> Physical protection: General Requirements at Fixed Sites:
>
> (a) Each licensee shall provide physical protection against radiological sabotage and against theft of special nuclear material at the fixed sites where licensed activities are conducted. Physical security systems shall be established and maintained by the licensee in accordance with security plans approved by the Nuclear Regulatory Commission. 10 CFR § 73.40(a) (emphasis added).

There are no exemptions to the provisions of § 73.40(a) for any type of licensee. 10 CFR § 73.6.

If Applicant is subject to the requirements of 10 CFR § 73.60 then 10 CFR § 50.34(d) requires plans for dealing with sabotage. If Applicant is not subject to 10 CFR § 73.60 then it still must have a security plan dealing with sabotage, despite the lack of specific regulatory criteria. The adequacy of such a plan is a matter for Board determination. Columbia Reactor Case. Therefore, regardless of the outcome of the issue of the applicability of 10 CFR § 73.60 to this facility, there is no question that Applicant must provide protection against radiological sabotage.[1/]

The clear and unambiguous language of the regulations is supported by the text of the 1979 and 1980 Annual Reports of the NRC to Congress. The 1980 report provides:

> Status of Safeguards at Non-Power Reactors. All licensed non-power reactors have operative security plans as required by 10 CFR § 73.40 ("Physical Protection: General Requirements at Fixed Sites") for protection against sabotage. In addition, licensees possessing less than formula quantities of SSNM have submitted security plans in accordance with the requirements of 10 CFR § 73.67 . . . for review and approval by the NRC. 1980 Annual Report: U.S. Nuclear Regulatory Commission, pp. 120-121. (emphasis added)

Staff's assertion that Applicant need not protect against sabotage is, as a matter of law, clearly erroneous. Staff is not entitled to Summary Disposition as a matter of law on Applicant's Security Plan and its Motion must therefore be denied.

1/ As noted above NRC Staff has argued that early detection and assessment capabilities provide adequate security at Applicant's facility. In the context of sabotage this assertion is absurd. Unlike theft and diversion, the danger to the public health and safety engendered by sabotage will have already occurred prior to early assessment and detection. No prevention is no protection. Therefore, an adequate plan must include sabotage prevention measures, sufficient so as to not be inimical to the common defense and security or to the public health and safety.

III

APPLICANT IS SUBJECT TO THE PROVISIONS OF 10 C.F.R. § 73.60.

A. Introduction.

NRC Staff's Motion asserts that the application is not subject to the requirements of 10 CFR § 73.60. The applicability of the requirements of 10 CFR § 73.60 is determined by the amount of SNM not subject to the exemption provided for in 10 CFR § 73.60. Thus, the two primary issues herein are the amounts of SNM requested by the license, and the capability of the Applicant to operate its reactor in such a manner as to achieve exempt, i.e. self-protection, status for SNM in the reactor core. NRC Staff has raised a third issue by claiming that the recent reduction of SNM inventory at the facility moots the entire issue.

BTG will demonstrate below that Applicant must have a security plan which meets the requirements of 10 CFR § 73.60 by virtue of the facts; (1) that Applicant is seeking a license for 5000 grams or more of non-exempt SNM; (2) that Applicant currently has on site at least 5000 grams of non-exempt SNM; and (3) that the fuel in the core of Applicant's reactor loses its self-protection characteristics after a shutdown of only eight hours, making self-protection of any amount of SNM at this facility impossible. On the basis of these facts Staff's Motion should be denied and discovery commenced to determine the adequacy of Applicant's physical security.

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B. Applicant Has 5000 grams of Non-exempt SNM At the Facility and is Therefore Subject To The Requirements of 10 CFR § 73.60.

Applicant, according to Dr. Wegst's August 8, 1982 letter to the NRC's Hal Bernard (Exhibit A) possesses 3.53 kilograms irradiated SNM, and 1.39 kilograms of unirradiated SNM at the facility. Applicant also possesses a 32 gram (2 curie) Pu-239 neutron start up source. According to the formula provided in 10 CFR § 73.60, an applicant which possesses 5000 grams or more of non-exempt SNM computed by adding the grams at U-235 (3.53 + 1.39 = 4920) to 2.5 times the grams of plutonium (2.5 X 32 = 80) which gives a total quantity (4920 + 80 = 5000 grams) of SNM at Applicant's facility, is subject to its provisions. Therefore, Applicant possesses a formula quantity of SNM and is subject to the provisions of 10 CFR § 73.60, unless some portion of the irradiated SNM qualifies for the self-protection exemption. As will be shown below none of the irradiated SNM so qualifies.

NRC Staff's Motion argues that the Pu-239 neutron source is exempt from the computation which determines the applicability of 10 CFR § 73.60. To make this argument staff has tortured the plain meaning of the regulations. 10 CFR § 73.60 provides that each non-power reactor licensee who possesses 5000 grams or more of SNM computed according to the formula provided therein . .

> ". . . shall protect the special nuclear material from theft or diversion pursuant to the requirements of § 73.67 (a), (b), (c), and (d) <u>and</u> as follows, except that a licensee is exempt from the requirements of this section to the exent that he possesses or uses special nuclear material which is

> not readily separable from other radioactive material and which has a total external dose rate in excess of 100 rems per hour at a distance of three feet from any accessible surface without intervening shielding. 10 CFR § 73.60 (emphasis added)

Thus, the only SNM which is exempt from the requirements of 10 CFR § 73.60 is that which meets the 100 rem external dose rate.

10 CFR § 73.67 (b)(1) provides:

> A licensee is exempt from the requirements of <u>this section</u> to the extent that he possesses, uses or transports: (i) special nuclear material which is not readily separable from other radioactive material and which has a total external dose rate in excess of 100 rems per hour at a distance of 3 feet from any accessible surface without intervening shielding, or (ii) sealed plutonium-beryllium neutron sources totalling 500 grams or less contained plutoniuim at any one site or contiguous sites, or (iii) plutonium with an isotopic concentration of exceeding 80 percent in plutonium-238. 10 CFR § 73.67 (b)(1) (emphasis added)

Staff argues that 10 CFR § 73.67 (b)(1)(ii) creates an exemption from the requirements of 10 CFR § 73.60 for Applicant's Pu-239 neutron source. This argument is incorrect.

10 CFR § 73.60 provides a specific exemption for 10 CFR § 73.60. 10 CFR § 73.67 (b)(1) by its own terms applies only to "this section", 10 CFR § 73.67. If the Commission desired to broaden the exemptions under 10 CFR § 73.60 they could have done so by adding specific exemptions to 10 CFR § 73.60. Furthermore, if they intended for the exemptions of 10 CFR § 73.67 (b)(1) to apply to 10 CFR § 73.60 they would not have provided the specific exemption in 10 CFR § 73.60. This is evident because of the fact that 10 CFR § 73.67(b)(1)(i) provides an identical exemption to the one found in 10 CFR § 73.60. Finally, the incorporation of 10 CFR § 73.67(b) into 10 CFR § 73.60 is conjunctive:

> "Each licensee . . . shall protect . . . pursuant to the requirements of 10 CFR § 73.67(a),(b),(c), and (d) and as follows . . . 10 CFR § 73.60.

Therefore, even if Applicant's Pu-239 neutron source is exempt from the requirements of 10 CFR § 73.67 it is not exempt from the requirements of 10 CFR § 73.60.

The construction of these provisions while appearing complicated on the surface merely requires a plain reading of the language of the regulations. The proper construction of the regulations, contrary to Staff's assertion, makes it clear that Applicant has at least 5000 grams of non-exempt SNM in its possession at this time and thus must have a security plan which meets the requirements of 10 CFR § 73.60. Therefore, Staff's motion should be denied.

C. The Application Must Be Judged By The Amount Of SNM For Which A License is Being Sought.

Even if the amount of SNM possessed by Applicant at this time was not at least 5000 grams, Applicant would still be subject to the requirements at 10 CFR § 73.60. The Applicant is seeking a license for the possession and use of 9400 grams of 93% enriched U-235 and a 32 gram (2 curie) PU-239 neutron source. In order to obtain such a license the Applicant's proposed physical security plan and measures must be capable of meeting the regulatory requirements for protecting the foregoing quantities of SNM.

On August 6, 1982 Applicant informed the NRC that it had shipped 2.36 kilograms of SNM off-site, allegedly reducing its SNM inventory to 4.92 kilograms. One of the stated purposes of this transfer was to avoid being subject to the requirements of 10 CFR § 73.60. August 6, 1982 letter Wegst to Bernard attached hereto as Exhibit A. However, Applicant has represented that it has no plans to amend its license to reflect the SNM reductions. In fact, Applicant is attempting to have its cake and eat it too by reducing its inventory six weeks before summary disposition, arguing that it is therefore now exempt from 10 CFR § 73.60 and retaining its authorization to bring the SNM back on site, perhaps shortly after the motion is disposed of or the hearings are finally concluded. The NRC Staff has made the same argument in the amendments to its Motion. Staff's Motion, Hand Corrections p. 11. Such an argument from an applicant seeking a twenty year license is untenable, unacceptable and an attempt to remove from its jurisdiction issues properly before the Licensing Board.

Applicant has applied for a twenty-year renewal of its facility license. The granting of the application is dependent upon Applicant providing reasonable assurances to the Licensing Board that it will, over the next twenty years, comply with NRC regulations and that the issuance of the license will not be inimical to the common defense or endanger the public health and safety. This is not an enforcement proceeding under 10 C.F.R. 2.200 et. seq. It is a licensing proceeding. Therefore, the adequacy of Applicant's application must be judged on the basis of the content thereof not on the ancillary promises and intentions of the Applicant.

Making an analogy to a new license proceeding provides a good illustration of the fallacy of the Applicant's and NRC staff's position that the regulatory criteria applicable to this license application are determined by the amount of SNM in Applicant's possession this week rather than the amount possessed six weeks ago or six weeks from now. In an original license proceeding an applicant possesses no SNM. Therefore, the application is judged according to the amount of SNM sought. It would not be acceptable for an Applicant to represent to a licensing board that while they were seeking a license for 9.4 kilograms of SNM and would thus be subject to the security requirements of 10 CFR 73.60, that they only really intended to bring 4.92 kilograms of SNM on site and thus a lesser security plan should provide a sufficient basis for approving the license for the full 9.4 kilograms. This approach makes a mockery of the concept of licensing.

The licensing process is designed to provide a periodic, complete, thorough and public review of a facility's operations and compliance capabilities. The NRC review policy and the meaningful public input embodied therein would be frustrated by allowing a license for 9.4 kilograms of SNM to be issued on the basis of meeting the standards for possession of 4.92 kilograms of SNM. Arguments such as the footnote to Staff's Motion (p. 11) which states that Applicant will have to report the receipt of any SNM miss the point at issue. A reasonable construction of the regulations taken as a whole and the furtherance of the purposes of the Atomic Energy Act require that the applicability of the provisions of 10 CFR § 73.60 be determined with reference to the content of the license application.

Finally, approving a license for possession of a formula quantity of SNM where such is not needed and where there is no security plan in place to protect such a quantity is contrary to the general policy of the Commission to reduce proliferation and security risks at research reactors. SECY-81-376 states that:

> In SECY 79-187B, 22 manpower reactor licensees were listed as having licenses to possess a formula quantity or more of SSNM. Of these 22, seven have taken or are taking action to reduce their holdings to less than a formula quantity of SSNM and the NRC will take action to amend their licenses to reduce possession authorization below a formula quantity. [UCLA is included in this list] SECY-81--76, Williamn J. Dircks, Executive Director for Operations, p. 2 (June 12, 1981). Relevant portions of which are attached hereto as Exhibit B.

Consistent with this statement by NRC Staff and because as will be shown below, Applicant's reactor operation cannot provide self-protection, the Applicant must either submit a plan which meets the requirements of 10 CFR § 73.60 or amend its licensed authorization to less than 5000 grams SNM.

D. The Requested Amounts Of SNM Require Applicant To Comply With 10 C.F.R. 73.60.

10 C.F.R 73.60 provides specific physical protection requirements for non-power reactor licensees in possession of 5,000 grams or more of SNM, exempting any SNM which is not readily separable from other radioactive material and which has a total external dose rate in excess of 100 rems per hour at a distance of three feet from any accessible surface without intervening shielding. In simple terms, the exemption considers the radiation level of the smallest unit of SNM which can be separately removed by a thief or a diverter (in an Argonaut reactor this is a fuel bundle). This exemption is based on the assumption that if that unit is highly irradiated, the radio-

activity itself will provide protection against theft and diversion. If a licensee possesses less than 5,000 grams of non-exempt SNM, they are subject only to the requirements of 10 C.F.R. § 73.67.

Applicant is seeking a license for 4,700 grams of fresh SNM, all non-exempt, and 4,700 grams of irradiated SNM, only exempt if its has an external radiation does rate in excess of 100 rems per hour at three feet unshielded. The external dose rate of the irradiated SNM is determined primarily by the frequency, duration and power level of the reactor operation. Under the licensed amounts then, Applicant would have 5,000 grams or more of non-exempt SNM at any point in time when more than 300 grams of irradiated fuel in the reactor core or storage holes had "cooled off" to a point where the external dose rate was less than 100 rem per hour at three feet unshielded. Therefore, in order for the application to be judged according to the requirements of 10 C.F.R. § 73.67, Applicant must be licensed to either have less than 5,000 grams of SNM on site, or have procedures within their license sufficient to assure that the irradiated SNM will at all times have an external dose rate in excess of 100 rem per hour at three feet unshielded. As will be detailed below, for the greater portion of the last 10 years, up until 6 weeks ago and even today Applicant has more than 5,000 grams of non-exempt SNM at the reactor facility.

1. <u>The reactor core must be sufficiently irradiated to provide self protection for the fuel bundles.</u>

As stated above the two central factors in determining the applicability of 10 CFR 73.60 are the quantity of the unirradiated SNM and the self-protection characteristics of the irradiated SNM. The "Inventory of U-235 Isotope in Fuel," chart (Exhibit C) provided by Applicant in response to Intervenors First Set of Interrogatories on Contention XX ("Contention XX Interrogatories") (Exhibit D) nicely illustrates the issue. From 12/31/71 to 9/30/80 Applicant had more than 5000 grams of SNM outside of the reactor core. Those quantities were non-exempt or in other words were not effected by the self-protection of operating the reactor.[2/] For the period 9/30/80 to 7/2/82 however, the self-protection features of the SNM in the reactor core become critical to determining the applicability of 10 CFR § 73.60 because the quantity of SNM outside the core was less than 5000 grams. We will focus on this period to demonstrate why it is imperative that this licensee either have a security plan which meets the requirements of 10 CFR § 73.60 in effect at all times or amends its license, reducing the total licensed amount of SNM below 5000 grams.

2. This reactor cannot operate in such a manner as to provide self-protection for the SNM in the core.

Applicant cannot, based upon its own calculations, operate the reactor in such a manner as to assure that the SNM in the reactor core will maintain an external radiation dose rate in excess of 100 rem per hour at three feet unshielded during periods of shutdown, including vacations, weekends and maintenance shutdowns.

2/ The irradiated fuel in the pits would have an external dose rate of less than 100 rem per hour at three feet unshielded within a relatively short priod of time.

In response to Intervenors Contention XX Interrogatories, Applicant provided calculations showing the external dose rates for the reactor core following pericds of normal reactor operation. (Exhibit H) Applicant concluded from these calculations that the reactor core would would retain sufficient radiation to be self-protecting for a period of one to two weeks after shutdown. However, Applicant's calculations are based on a misinterpretation of the regulatory exemption. When the error is corrected, the calculation determines that, in fact, the SNM is only self-protected for a period of less than eight hours.

Applicant's error was in calculating the external dose rate for the entire reactor core. 10 CFR 73.60 provides an exemption for sufficiently irradiated SNM which is not readily separable from other irradiated SNM. In other words one must measure the external radiation dose rate of the smallest discreet unit of SNM, in this case a single fuel bundle. The logic of this requirement is clear. One seeking to steal SNM will not seize the entire reactor core at one time. One would remove the smallest readily separable unit, the fuel bundle, and carry it away separately, the precise procedure used by Applicant to load and unload the fuel. This interpretation of the exemption portion of 10 CFR 73.60 was confirmed by a Mr. G.K. Knulsen, listed in SECY-81-376A, as the NRC contact person for proposed amendments to 10 CFR 73.67. In a recent phone conversation he stated that the current rule regarding the exemption calls for a calculation for each discreet fuel element, i.e. bundle that can be readily removed. See Declaration of Daniel O. Hirsch attached hereto as Exhibit I. This interpretation is also evident in the

"Special Nuclear Material Self Protection Criteria Investigation (December 27, 1980) conducted by the Los Alamos Scientific Laboratory, a summary of which is attached hereto as Exhibit J. (Special attention on this point should be directed to paragraphs 2 and 4.)

The core of Applicant's reactor is made up of 24 separate, unconnected fuel bundles. Each bundle is removed by hooking a simple hand held gaffing hook through the metal ring on the top of the bundle and lifting it out of the core. Therefore, the unit of SNM the external radiation dose rate of which must be measured for determining exemption from 10 CFR § 73.60 at Applicant's facility, is the fuel bundle.

The calculations provided by Applicant measure the dose rate of the entire core. To determine the external dose rate of a single bundle one must divide the dose rate of the entire core by 24, the number of bundles in the core. One must also adjust the calculation for the fact that it was based on the dose rate at four feet from the core center, to compensate for the thickness of the core, rather than three feet from the single bundle. Making this adjustment the external dose rate of a single bundle would be approximately one fourteenth that of the entire reactor core. Declaration of Roger Kohn, attached hereto as Exhibit K; see also paragraph 11 of the Declaration of Dave Hafemeister, attached hereto as Exhibit L.

Using the formula provided by Applicant for determining external dose rates after periods of normal operation and applying it to single fuel bundle one finds that the fuel bundle dips below the 100 rem exemption threshhold in less than eight (8) hours after the reactor shuts down. Declaration of Roger Kohn, Exhibit K.

Assuming the accuracy of Applicant's own equation and assumptions, the SNM loses its inherent self-protection ability after a shutdown of less than eight hours. This reactor presently averages only about 2 hours of operation a week. The Technical Specifications limit it to 8.5 hours operation per average week, in order to assure compliance with 10 CFR part 20 emissions standards. Under these conditions Applicant cannot operate its reactor in such a manner as assure that the SNM in the core will at all times qualify for the 10 CFR § 73.60 exemption. Therefore, unless Applicant's security measures are capable of meeting the requirements of 10 CFR 73.60, Applicant cannot have more than 5000 grams of SNM on site and cannot be licensed to possess such amounts.

3. Applicant's past record does not indicate compliance with self-protection standards.

Even if it were possible for Applicant to avoid the requirements of 10 CFR 73.60 by maintaining self-protecting levels of SNM radiation, their past record suggests that they cannot assure that such self-protection procedures will be implemented.

On January 12, 1981 Applicant was explicitly informed by the NRC Staff that it must maintain self-protecting radiation levels in the core or meet the requirements of 73.60. See 1/12/81 letter Miller to Wegst attached hereto as Exhibit M. On January 29, 1981 Applicant responded that it was scheduling reactor operations to meet self-protection criteria and was planning to ship SNM off-site. See 1/29/81 letter Wegst to Miller attached hereto as Exhibit N. On July 21, 1982, 18 months thereafter, Applicant allegedly reduced its SNM inventory to 4.92 kilograms. Let us examine the self protection efforts undertaken by Applicant during this 18 month period.

In response to Intervenor's Contention XX Interrogatories, Interrogatory No. 13, which asked:

> Have any rules or procedures regarding the operation or use of the reactor been imposed to insure that the U-235 in the reactor core is at all times in a state of having an external dose rate in excess of 100 rem per hour at 3 feet unshielded? If so, please describe:
>
> (a) Each such rule or procedure;
>
> (b) When each such rule or procedure was implemented.

Applicant answered:

> There are no written rules or procedures. However, the reactor is operated an average at 200 KWH per week which provides a conservative margin for meeting the self-protecting conditions.
>
> (a) See response above.
>
> (b) Specific attention was made to observing the self-protecting conditions beginning in January 1981.

(copies of Intervenors Interrogatories and Applicant's answers are attached hereto as Exhibits D and E respectively). In response to Intervenors follow up questions in which it asked:

> E(2) Please provide all other calculations or computer runs, if any, from January 1981 to the present that were conducted to, or that could be used to, estimate operating conditions necessary to maintain the fuel at 100 rem/hour.

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The response:

E(2) No previous calculations were formalized or retained.

(copies of the follow-up questions and answers are attached hereto as Exhibits F and G respectively.)

The conclusion to be drawn from these answers appears to be that despite explicit direction from NRC Staff, Applicant did not perform any calculations to determine what measures would be necessary to maintain a self-protecting condition until 18 months after the fact. Applicant did not institute any procedures for insuring that whatever efforts it was making would be implemented, and when the calculation was finally formalized it reflected a tremendously significant error based on a misinterpretation of the regulatory requirements. This is not a record[3/]

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3/ Applicant's record over the entire license period was no better. In 1959 Applicant was licensed for 4000 grams of U-235 and actually had 3500 grams on site. In October of 1970 the AEC issued Amendment 8 to Applicant's license authorizing an increase from 4000 grams to 10,000 grams U-235. The increase was requested to fabricate a new fuel loading. In October of 1974 after receipt of additional SNM, Applicant was in possession of 5.094 kilograms of non-exempt SNM. Ashbaugh to Goller letter 10/28/74, exhibit O. In November Applicant was reminded that it might be in violation of 10 CFR part 73. Lear to Regents (Hicks) letter 1/28/74, exhibit P. On December 12, 1979 Applicant shipped 340 grams offsite in order to comply with the 5 Kg limit and approval of their security plan. Asbaugh to Goller letters 11/27/74 and 12/12/74, exhibits Q and R respectively. Sometime thereafter a routine security investigation by the NRC discovered that Applicant still had more SNM on site than was consistent with their security plan. Catton to Rogasa letter 11/9/78, exhibit S. Six months later the material was still on site. Catton to Berger letter 3/1/79, exhibit T. The actual shipment offsite of 730 grams was not accomplished until June of 1980. In January 1981 Applicant was once again notified that it was in possession of formula quantities of SNM.

upon which to issue a license for possession of formula quantity SNM.

There are other disturbing features of this record which have significant implications for the Board's consideration of these issues. In 1980 BTG submitted its contentions alleging *inter alia* that Applicant was subject to the requirements of 10 CFR § 73.60. On January 12, 1981 three weeks prior to the pre-hearing conference scheduled to rule on the admissibility of BTG's contentions, the NRC's Jim Miller informed Applicant that it possessed formula quantities of SNM and must meet the requirements of 10 CFR § 73.60 and 73.67. On January 29, 1982 Applicant responded that it would temporarily schedule reactor operations to conform with self-protection criteria and would attempt to reduce its inventory. On February 4, 1981, the NRC Staff in pleadings filed beforehand, argued before the Board that Applicant did not have sufficient SNM to be subject to 10 CFR § 73.60. No mention was made of Miller's letter to Applicant, only three weeks prior, which essentially confirmed BTG's contention. A few months later, in April of 1981, NRC Staff moved for summary disposition on the security contention. this motion included an affidavit from Miller stating that he had personally confirmed that the external dose rate of the fuel in the core was in excess of 100 rem per hour at three feet unshielded. This paragraph was deleted in the most recent amendments. Over a year later Applicant's responses to BTG's Interrogatories strongly suggest that Applicant had done little or nothing to insure that the reactor fuel was being maintained in a self-protecting condition. Finally, one week before the most recent pre-hearing conferen Applicant ships 2.36 kg of SNM off-site. No mention of this is made at the pre-hearing conference despite the fact that the applicability of 10 CFR § 73.60 is a major topic of discussion. Now Applicant and Staff are raising the argument that the recent shipment obviates the need to meet the requirements of 10 CFR § 73.60, effectively removing from the Board's jurisdiction the question of Applicant's ability to adequately protect the amount of SNM for which it is seeking a license.

The Board has jurisdiction to rule on the ability of the Applicant to assure that it will comply with the regulations and that the issuance of a license will not be inimical to the common defense and security and will not endanger the public health and safety. This constant subterfuge to the hearing process is contrary to the policies of the Commission and to the purposes of the Atomic Energy Act and should be stopped.

IV

CONCLUSION

In order to prevail on this portion of its Motion for Summary Disposition NRC Staff must demonstrate that as a matter of law, Applicant is not subject to the requirements of 10 CFR § 73.40(a) (sabotage) and 10 CFR § 73.60 (theft or diversion). Staff has not done so and its Motion must be denied.

Intervenor BTG has shown herein, that pursuant to 10 CFR § 73.40, Applicant's proposed security plan must provide protection against sabotage. There are no facts showing that the plan provides such protection, indeed all of the Staff's arguments suggest that it does not. Therefore, Staff's motion must be denied as to sabotage protection.

Intervenor BTG has also shown that the Applicant is not physically capable of operating the reactor every eight hours, the amount determined by its own calculations to be necessary to maintain self-protecting dose rates in the reactor fuel bundles. Consequently, possession of the requested amount of SNM, 4700 grams unirradiated and 4700 grams irradiated but not self-protecting, would ncessarily and in all case subject Applicant to the requirements at 10 CFR § 73.60. Therefore, Applicant must either have a plan which meets the requirements of 10 CFR § 73.60 or amend its license request to less than 5000 grams of SNM. If the Board decides otherwise, it will be authorizing possession of formula quantities of SNM without reasonable assurance that the regulations will be complied with and the SNM adequately protected.

Finally, Intervenor Bridge the Gap has shown that with the inclusion of the Pu-239 neutron source in its SNM inventory pursuant to the provisions of 10 CFR § 73.60, Applicant without question presently possesses 5000 grams of non-exempt SNM and must meet the requirements of 10 CFR § 73.60.

Therefore, and without move, NRC Staff's motion should be denied.

DATED: 9/7, 1982.

Respectfully submitted,
Committee To Bridge The Gap

By [signature]
John H. Bay
Nuclear Law Center
Attorneys for Intervenor Bridge The Gap (Contention XX)

UNIVERSITY OF CALIFORNIA, LOS ANGELES UCLA

BERKELEY · DAVIS · IRVINE · LOS ANGELES · RIVERSIDE · SAN DIEGO · SAN FRANCISCO SANTA BARBARA · SANTA CRUZ

COMMUNITY SAFETY DEPARTMENT
OFFICE OF RESEARCH & OCCUPATIONAL SAFETY
LOS ANGELES, CALIFORNIA 90024

6 August 1982

Mr. Hal Bernard, Acting Branch Chief
Standardization and Special Projects Branch
Division of Licensing
U.S.Nuclear Regulatory Commission
Washington, D.C. 20555

Docket 50-142

Dear Mr. Bernard:

This is to advise you that UCLA recently transferred off-site a quantity of unirradiated U-235 reactor fuel sufficient to reduce the total inventory of U-235 at the UCLA facility to 4.92 kilograms - 3.53 kilograms irradiated, and 1.39 kilograms unirradiated. The off-site transfer was completed on July 21, 1982. I have enclosed copies of the fuel transfer forms for this shipment.

As you know, UCLA had been planning for some time to make this fuel transfer in order to remove an unnecessary constraint on future facility operations. In connection with this, in January 1981, the Commission informed UCLA that in order for UCLA to remain exempt from the Commission's upgraded safeguards regulations which became effective in November 1979, UCLA would either have to maintain the self-protecting conditions for the "in-core" fuel (100 Rem/hr at 3 feet, unshielded) or reduce its inventory of "fresh" fuel in storage [J. R. Miller letter to W. F. Wegst, January 12, 1981]. In response, UCLA informed the Commission that reactor operations were being scheduled to maintain the self-protecting conditions for the in-core fuel but that UCLA was also planning to reduce its unirradiated fuel inventory [W. F. Wegst letter to J. R. Miller, January 29, 1981].

UCLA has determined that under normal reactor operating conditions the self-protection criteria are generally satisfied. However, now that the total inventory of reactor fuel at the facility has been reduced to below 5 kilograms, UCLA need not maintain the self-protecting conditions to remain exempt from the safeguards requirements contained in 10 CFR 73.60. As a result UCLA need not be concerned with the possibility that the reactor may have to be shut down for an extended period of time at some time in the future.

Sincerely,

Walter F. Wegst

Walter F. Wegst, Director
Office of Research & Occupational Safety

WFW/jb

enc.

EXHIBIT A

RULEMAKING ISSUE
(Affirmation)

June 12, 1981

SECY-81-376

For: The Commissioners

From: William J. Dircks
Executive Director for Operations

Subject: PHYSICAL SECURITY REQUIREMENTS FOR NONPOWER REACTOR LICENSEES POSSESSING A FORMULA QUANTITY OF SSNM

Purpose: To provide the Commissioners with (1) a status report on the 22 nonpower reactor licensees listed in SECY 79-187B; (2) a resolution of the issues listed in SECY 79-187C; (3) a discussion of alternative physical security requirements for nonpower reactors possessing a formula quantity or greater of SSNM; and (4) a recommendation on the preferred alternative.

Discussion: Background

On July 24, 1979, the Commission approved a recommendation that nonpower reactor (NPR) licensees be deferred from implementing the requirements of the Safeguards Upgrade Rule, and that in the interim new Category II (§73.67) physical protection requirements as well as previous existing requirements (§73.60) be applied to nonpower reactor licensees who possess formula quantities of SSNM. The interim requirements were to continue in force until certain nonpower reactor issues were resolved and a determination was made on what physical protection requirements are actually needed at these particular nonpower reactor facilities, given the unique type, form, and enrichment levels of the reactor fuel. The Commission asked the staff for an interim status report in 120 days which would give a more definitive explanation of the nonpower

Contact:
C. K. Nulsen, SGRI
42-74181

EXHIBIT B

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reactor problem and actions being taken to determine the appropriate physical protection requirements for these facilities. The interim status report was published on December 19, 1979, as SECY 79-187C.

The four issues identified in SECY 79-187C and addressed in this paper are the determination of:

1. What radiation dose rate levels are needed for exemption purposes, (review the 100 rem/hr at 3 feet standard),

2. What safeguards credit should be given for fuel type and reactor design,

3. What constitutes "contiguous site" based on reasonable application of 10 CFR 73.60,

4. What safeguards credit should be given for intermediate enrichments of fuel.

Nonpower Reactor Status Report

In SECY 79-187B, 22 nonpower reactor licensees were listed as having licenses to possess a formula quantity or more of SSNM. Of those 22, seven have taken or are taking action to reduce their holdings to less than a formula quantity of SSNM and the NRC will take action to amend their licenses to reduce possession authorization below a formula quantity. These seven licensees are:

- Babcock and Wilcox, Lynchburg, Virginia
- Pennsylvania State University
- University of Missouri (Rolla)
- University of Washington
- Rensselear Polytechnical Institute
- Westinghouse, Zion, Illinois
- University of California (Los Angeles)

The remaining fifteen nonpower reactor licensees will continue to possess 5 kgs or more of highly enriched uranium (HEU) onsite and the determination of the appropriate safeguards category for each of these reactors is contingent upon the resolution of the issues addressed in this paper. These fifteen nonpower reactors are:

- General Electric, Vallecitos, California
- Georgia Tech
- Massachusetts Institute of Technology
- Union Carbide, Tuxedo, New York
- Rhode Island AEC
- University of Michigan
- University of Virginia

- o Oregon State University
- o Texas A&M University
- o University of Wisconsin
- o Washington State University
- o Virginia Polytechnical Institute
- o General Atomic, La Jolla, California
- o University of Missouri (Columbia)
- o National Bureau of Standards (NBS)

Resolution of Issues

1. Radiation Levels. Los Alamos National Scientific Laboratory (LASL) has performed a study to assist in determining if a technical basis exists for exempting certain facilities from Category I physical security requirements because of fuel irradiation levels. As a part of the study, LASL examined the time it would take an adversary to steal a formula quantity of SSNM in the form of irradiated fuel from a reactor facility in order to calculate total exposure of an adversary to a source having a radiation dose rate of 100 rem/hr at 3 feet.* It also discussed the likelihood that an adversary would be detected if certain radiation detection systems were in place. A detailed summary of the findings of this study is provided in Enclosure B. The following is a synopsis of the major points made by the study.

Radiation. The study found no strong technical basis for changing NRC policy on the 100 rem/hr dose rate exemption level and made several interesting observations without endorsing any particular level of radiation as an exemption standard. It pointed out that a dose rate level of 10,000 rems/hr would be necessary to cause immediate incapacitation and certain death within hours, and a dose rate level of about 2000 rem/hr would give high assurance of eventual death based on short exposure time. However, it further stated that although the 100 rem/hr dose rate level may not result in an incapacitating dose, it does provide a deterrence based on the potentially hazardous health effects of nuclear radiation. Whereas this deterrence applies to any radiation dose rate level, the present exemption criterion establishes a degree of certainty that the radiation dose rates for material qualifying the licensee for exemption will be at least at the 100 rem/hr level and therefore offers more assurance of deterrence and detection than would the absence of a specified level of radiation. Additionally, it was pointed out that there is a cumulative dose effect of radiation when multiple fuel rods are handled individually over a period of

*Presently, a licensee is exempt from most physical protection requirements at fixed sites (e.g., §73.6(e) and §73.67(b)(1)(i)) to the extent he possesses not readily separable SSNM with a total external radiation dose rate exceeding 100 rems per hour at 3 feet from any accessible surface without intervening shielding - hereinafter referred to as the 100 rem/hr dose rate level. Other dose rate levels are defined and referred to similarly.

time. This adds an increased deterrence factor because of increased radiation exposure level. In support of the present exemption, the 100 rem/hr at 3 feet (1 meter for IAEA) radiation dose rate exemption criterion is an internationally accepted standard and substantial proof of the need to alter the radiation levels for purposes of defining self-protecting nuclear material should exist before it is abandoned. In addition, the 100 rem/hr criterion also applies for exemption purposes to other than just NPR licensees. It presently applies to fuel-away-from-power-reactor-storage-sites and serves as a threshold level for determining the type of protection required for irradiated fuel in transit. Fuel with a dose rate above the 100 rem/hr level is treated as irradiated; fuel at or below this level is treated as unirradiated.

Also, irradiating fuel beyond the 100 rem/hr dose rate level for the sole purpose of obtaining higher assurance of protecting fuel rods against theft rather than for operational necessity, is contrary to health and safety management practices as expressed in the ALARA (as low as reasonably achievable) principle. Maintaining higher radiation levels also increases the potential consequences of sabotage.

Time. The minimum time for obtaining access to a formula quantity of SSNM and removing it is a function of fuel type, reactor design and building layout and is thus site specific. The time is dependent on the shielding of the reactor; the difficulty of removal of the fuel elements from the reactor core; the number of elements that must be removed; the distance the elements must be moved to reach a get-away vehicle; the difficulty of neutralizing doors and alarms that must be bypassed, and the number of such obstacles; the number of individuals involved in the theft; and the process by which the vehicle is loaded. According to LASL the total time necessary for the theft from a typical NPR up to the time the vehicle leaves the site is from 1.25 to 1.5 hours, if all of the fuel elements taken are from the reactor. Most of that time is spent in removing the elements from the pool rather than in the transfer from the pool to the vehicle, which could be accomplished in less than 1/2 hour. If a minimum number of fuel elements are taken from the core and the majority are taken from a storage vault, the total time for the theft would be reduced but probably would take at least 1/2 hour.

Since in most cases it would take the adversary over an hour to remove the formula quantity of SSNM from the core and storage vault, and in many cases considerably longer, it would appear prudent to allow the facility's physical protection system to depend upon offsite response forces to prevent the successful removal of a formula quantity. Most local law enforcement agencies (LLEAs) would be able to respond effectively within a half-hour. The proposed requirement for offsite response capability could be

LOS ANGELES: SCHOOL OF ENGINEERING
AND APPLIED SCIENCE

MEMORANDUM

25 August 1982

TO: W. Cormier
2241 Murphy

FROM: N. Ostrander
2567 Boelter Hall

SUBJ: NEL Fuel Inventory Since 1970

I have constructed the attached inventory record for your response to Mr. Bay's request of August 18, 1982. Inventorial practices have changed over the several AEC-ERDA-NRC administrations and even within the lifetime of the NRC. The general trend has been to add detail by distributing inventory into an increasing number of categories. Descriptive words have been replaced by a three symbol code. There have been several generations of such codes, and no assurance that they are one-for-one translatable. For example, one can translate "encapsulated, enriched, unirradiated, uranium-alloy scrap" into the category "uranium" but the inverse transformation is not possible.

All of this goes to say that I have made a best effort to provide a complete record, but I have had to make some interpretations based upon continuity of category by continuity of numbers. I cannot attest to the absolute accuracy of the record. I think it is a reasonable, but not necessarily unique interpretation of the available records.

INVENTORY OF U-235 ISOTOPE IN FUEL, kg

DATE	Irradiated Fuel		Fresh Fuel		TOTAL
	In-Core	In Pits	Useful	Scrap	
3-31-70	3.50	-	-	0.02	3.52
6-30-71	3.50	-	2.53	0.02	6.05
12-31-71	3.56	0.73	3.74	0.94	8.97
12-21-74	3.55	0.73	3.74	0.60	8.62
9-30-80	3.53	-	3.74	0.60	7.87
9-30-81	3.53	-	3.75	-	7.28
8-25-82	3.53	-	1.39	-	4.92

Except for the small burn-up (~ 1 gm per year), the inventories are constant over any interval between adjacent dates. E.g., from 12-31-74 to 9-30-80, the total inventory was approximately 8.62 kilograms. The dates are inventorial record dates and not the actual dates of the material transfer.

EXHIBIT C

JOHN H. BAY
DOROTHY THOMPSON
NUCLEAR LAW CENTER
6300 Wilshire Blvd., Suite 1200
Los Angeles, California 90048
Telephone: (415) 393-9234
(213) 453-3973

Attorneys For Intervenor (Contention XX)
Committee To Bridge The Gap

UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

IN THE MATTER OF THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (UCLA Research Reactor)	Doc. No. 50-142 (Proposed Renewal of Facility License No. R-71)

INTERVENORS' FIRST SET OF INTERROGATORIES ON CONTENTION XX PURSUANT TO COURT ORDER

TO: APPLICANT, THE REGENTS OF THE UNIVERSITY OF CALIFORNIA AND ITS ATTORNEYS OF RECORD:

Intervenor, Committee to Bridge the Gap, requests that applicant, The Regents of the University of California, answer the following interrogatories separately and fully under oath, pursuant to Section 2.740b of Title 10 of the Code of Federal Regulations, and that the answers be signed by the person making them and served on intervenor on August 9, 1982 These interrogatories are served pursuant to court order at the Pre-hearing Conference held on Wednesday, June 30, 1982.

In answering these interrogatories, please furnish all information that is available to applicant, including, without limitation, information in possession of applicant's attorneys,

EXHIBIT D

agents and employees, not merely information known to the personal knowledge of the person making the answers. If the person making the answers cannot answer any of the following interrogatories in full after exercising the reasonable diligence to secure the information, please so state, and then answer the interrogatories to the fullest extent possible, specifying the reasons for the inability to answer, and further describing the efforts undertaken to secure the information, and setting forth any knowledge applicant may have concerning the unanswered portions.

I.

DEFINITION OF TERMS

As used in the following interrogatories, the following terms shall have the following meanings.

1. The term "UCLA/NEL" means the Regents of the University of California, the University of California at Los Angeles, the Nuclear Energy Laboratory at UCLA, their agents, employees and representatives.

2. The terms "you" and "your" shall mean UCLA/NEL.

3. The term "the reactor" shall mean the Argonaut type nuclear reactor located in Boelter Hall on the UCLA campus.

4. The term "reactor facility" shall mean the building, rooms, and structures, containing and surrounding the reactor which are related to the operation, maintenance and fuel storage of the reactor.

5. The term "SNM" shall mean special nuclear materials as that term is defined in 10 CFR Section 73.2(x).

6. The term "U-235" shall mean Uranimum in the U-235

isotope.

7. The term "communication" shall mean any transfer of information between two or more parties.

8. The term "application" shall mean the application for relicensing of the UCLA Research Reactor filed by the Regents of the Univeristy of California on February 28, 1980 and the amendments thereto.

9. The term "present" shall mean as of the date of applicant's response to these interrogatories.

II.

INTERROGATORIES

INTERROGATORY NO. 1:

Please provide a table or data for the period of January 1, 1970 to the present, which indicates for each day during that period, the amount of U-235 enriched more than 20%, which was at the reactor facility, and not in the core of the reactor.

INTERROGATORY NO. 2:

Please provide a table or data for the period of January 1, 1970 to the present, which indicates for each day during that period, the amount of U-235 enriched more than 20%, which was in the core of the reactor.

INTERROGATORY NO. 3:

Please provide a table or data for the period from January 1, 1970 to the present, which indicates for each day during that period the amount of U-235 enriched more than 20% which was in the fuel storage holes.

INTERROGATORY NO. 4:

Has UCLA/NEL ever had more than 5,000 grams of U-235 enriched more than 20%, with a total external radiation dose rate of less than 100 Rems per hour at a distance of three feet unshielded, at the reactor facility? If it has, please indicate:

(a) The dates upon which this condition occurred;

(b) The circumstances which resulted in this condition; and

(c) Precisely how you were able to determine that the condition existed.

INTERROGATORY NO. 5:

Please indicate, for the period January 1, 1970 to the present, each date upon which the U-235 in the reactor core had an external radiation dose rate of less than 100 Rem per hour at 3 feet unshielded.

INTERROGATORY NO. 6:

Please describe how the external radiation dose rate of the U-235 in the reactor core is determined.

INTERROGATORY NO. 7:

If the answer to Interrogatory No. 6 indicates that the determination is made by direct measurement, please indicate:

(a) At what frequency the measurements are taken;

(b) Whether measurements are taken for each plate, each bundle, or for the whole core;

(c) Each date upon which such measurement has been taken, and the results thereof;

(d) The accuracy of the measurement instrument and the basis upon which you make this assessment of its accuracy.

INTERROGATORY NO. 8:

If the answer to Interrogatory No. 6 indicates that the determination is made by some method other than direct measurement, please describe such method and the calculations, data, and resource materials used as a basis for using such a method making the determination.

INTERROGATORY NO. 9:

Describe the operating conditions necessary to keep the U-235 in the reactor core in a state of having an external radiation dose rate of greater than 100 Rem per hour at 3 feet unshielded, including but not limited to:

(a) The power at which the reactor must be operated;

(b) The amount of time which the reactor must be operated.

INTERROGATORY NO. 10:

After a period of normal operating conditions, how many days of non operation does it require for the U-235 in the reactor core to drop below an external radiation dose rate of 100 Rem per hour at 3 feet unshielded?

INTERROGATORY NO. 11:

Please describe any factors which would increase or decrease the number of days indicated in the answer to Interrogatory No. 10.

INTERROGATORY NO. 12:

In order to maintain the external radiation dose rate of the U-235 in the reactor core at a level greater than 100 Rem per hour at three feet unshielded, during a three day shutdown,

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for how many hours and at what power would the reactor have to run prior to that shutdown?

INTERROGATORY NO. 13:

Have any rules or procedures regarding the operation and use of the reactor been imposed to insure that the U-235 in the reactor core is at all times in a state of having an external dose rate in excess of 100 Rem per hour at 3 feet unshielded? If so, please describe:

(a) Each such rule or procedure;

(b) When each such rule or procedure was implemented.

INTERROGATORY NO. 14:

Please describe the procedures that exist in order to insure that the external radiation dose rate of the U-235 in the reactor core is maintained at over 100 Rem per hour at 3 feet unshielded, for each of the following situations;

(a) Long weekends;

(b) Holidays or vacations;

(c) Final examination periods;

(d) Quarter breaks;

(e) Refueling;

(f) In-core maintenance;

(g) Experiments requiring in core placement;

(h) Experiments requiring reactor shutdown several days prior to or after the experiment;

(i) Maintenance or calibration requiring a reactor shutdown of several days;

(j) Unintentional SCRAMS or other malfunctions, the cause or repair of which cannot be determined or accomplished within several days;

(k) Lack of business or other reason to operate the reactor other than for the purpose of maintaining the radiation level of the fuel.

INTERROGATORY NO. 15:

Has UCLA/NEL made any commitment to the NRC to keep the U-235 in the reactor core in a state of having an external dose rate in excess of 100 Rem per hour at 3 feet unshielded? If so, please indicate how the commitment was communicated, e.g., license amendment, letter, oral communication, and give the dates for each such communication.

INTERROGATORY NO. 16:

If the answer to Interrogatory No. 14 is in the affirmative, please indicate each date after such a committment was made, on which the U-235 in the reactor core had an external dose rate of less than 100 Rem per hour three feet unshielded.

INTERROGATORY NO. 17:

Does the proposed Technical Specifications contained in the Application include a three week cooling off period for the reactor prior to fuel operations? If they do, please indicate what procedures would be used to insure that the U-235 in the reactor core is kept in a state of having an external radiation dose rate of greater than 100 Rem per hour at three feet unshielded, during this cooling off period.

INTERROGATORY NO. 18:

In the event of a reactor malfunction or SCRAM which would normally require shutting down the reactor for a sufficient period of time for the U-235 in the core of the reactor to reach a state of having an external radiation dose rate of less than 100 Rem per hour 3 feet unshielded, which would take precedence, the need to maintain the radiation level, or the need to evaluate and repair the malfunction?

INTERROGATORY NO. 19:

Has the NRC ever communicated to UCLA/NEL that UCLA/NEL needed to reduce its SNM inventory in order to insure that it was in compliance with NRC regulations? If so, please describe each such communication and the date on which it occurred.

INTERROGATORY NO. 20:

Has UCLA/NEL ever been found in non-compliance with NRC security or safeguard regulations? If so, please describe each such violation and the date on which it occurred.

INTERROGATORY NO. 21:

What is the highest dose rate for irradiated U-235 permitted to be stored in the spent fuel storage holes by UCLA/NEL's current license?

INTERROGATORY NO. 22:

Does UCLA/NEL assert that from the present to the year 2000, the external radiation dose rate of the U-235 in the core of the reactor will never be less than 100 Rem per hour at 3 feet unshielded? If not, please indicate under what circumstances the dose rate is expected to be less than 100 Rem per hour at 3 feet unshielded.

INTERROGATORY NO. 23:

Please indicate the minimum quantity of U-235 which is necessary to operate the reactor and still have it able to

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rm the functions, experiments and tasks which it now per-

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ROGATORY NO. 24:

Please indicate the maximum quantity of U-235 which can intained in the reactor core under current and proposed ıses.

RROGATORY NO. 25:

Please provide all facts not provided in response to above interrogatories which indicate under UCLA/NEL's pro-d operating license, that UCLA/NEL's inventory of SNM at the tor facility will not exceed 5,000 grams of U-235 enriched than 20% not having an external dose rate in excess of 100 per hour at 3 feet unshielded.

DATED: July 20, 1982.

By ______________________
John H. Bay
Attorneys for Intervenor
(Contention XX)

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (UCLA Research Reactor)	)))))))	Docket No. 50-142 OL (Proposed Renewal of Facility License)

CERTIFICATE OF SERVICE

I hereby certify that copies of the attached: Intervenors' First Set of Interrogatories on Contention XX Pursuant to Board Order

in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, postage prepaid, addressed as indicated, on this date: July 20, 1982.

John H. Frye, III,
Chairman
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Emmeth A. Luebke
Administrative Judge
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Oscar H. Paris
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Chief, Docketing and Service Section (3)
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Counsel for NRC Staff
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
attention: Ms. Colleen P. Woodhead

William H. Cormier
Office of Administrative Vice Chancellor
University of California
405 Hilgard Avenue
Los Angeles, California 90024

Christine Helwick
Glenn R. Woods
Office of General Counsel
590 University Hall
2200 University Avenue
Berkeley, CA 94720

Sarah Shirley
Deputy City Attorney
Office of the City Attorney
City Hall
1685 Main Street
Santa Monica, CA 90401

Committee to Bridge the Gap
1637 Butler Avenue, Suite 203
Los Angeles, California 90025

Daniel Hirsch
P.O. Box 1186
Ben Lomond, CA 95005

Dorothy Thompson
Nuclear Law Center
6300 Wilshire Blvd., Suite 1200
Los Angeles, CA 90048

[signature]

John Bay
Counsel for Intervenor
COMMITTEE TO BRIDGE THE GAP

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket No. 50-142
THE REGENTS OF THE UNIVERSITY OF CALIFORNIA	)	(Proposed Renewal of Facility License Number R-71)
	)	
(UCLA Research Reactor)	)	August 9, 1982

UNIVERSITY'S RESPONSE TO INTERVENOR'S FIRST SET OF INTERROGATORIES ON CONTENTION XX

PROPOUNDING PARTY: Intervenor Committee to Bridge the Gap

RESPONDING PARTY: Applicant The Regents of the University of California

SET NUMBER: One

DONALD L. REIDHAAR
GLENN R. WOODS
CHRISTINE HELWICK
590 University Hall
2200 University Avenue
Berkeley, California 94720
Telephone: (415) 642-2822

Attorneys for Applicant

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

EXHIBIT E

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (University) responds to the Committee to Bridge the Gap's first set of interrogatories on Contention XX as follows:

RESPONSE TO INTERROGATORY NO. 1

University objects to the question to the extent that the question seeks specific figures on the quantity of the fuel present at the facility for each day since 1970 on the grounds that the compilation of such specific information would be unreasonably burdensome, would require the release of protected information and that such specific information is not reasonably calculated to lead to the discovery of evidence admissible on the question of the applicability of 10 CFR Part 73 safeguards regulations, which is the extent of the scope of discovery that has been permitted by the Board. Notwithstanding, and without waiving, the aforesaid objections, University answers as follows: For each day of the period less than 5 kilograms of U-235 enriched more than 20% was at the reactor facility and not in the core of the reactor except for periods of major "in-core" maintenance when the "in-core" fuel was removed from the core. The last period of major "in-core" maintenance occurred in 1974. As a result of the most recent transfer of fuel off-site, unirradiated fuel in storge on-site has been reduced to 1.39 kilograms. Irradiated fuel in the core is 3.53 kilograms.

RESPONSE TO INTERROGATORY NO. 2

University objects to the question to the extent that the question seeks specific figures on the quantity of the fuel present at the facility for each day since 1970 on the grounds that the compilation of such specific information would be unreasonably burdensome, would require the release of protected information and that such specific information is not reasonably calculated to lead to the discovery of evidence admissible on the question of the applicability of 10 CFR Part 73 safeguards regulations, which is the extent of the scope of discovery that has been permitted by the Board. Notwithstanding, and without waiving, the aforesaid objections, University answers as follows: For each day of the period, less than 3.6 kilograms of U-235 enriched more than 20% was in the core of the reactor.

RESPONSE TO INTERROGATORY NO. 3

University objects to the question to the extent that the question seeks specific figures on the quantity of the fuel present at the facility for each day since 1970 on the grounds that the compilation os such specific information would be unreasonably burdensome, would require the release of protected information and that such specific information is not reasonably calculated to lead to the discovery of evidence dismissible on the question of the applicability of 10 CFR Part 73 safeguards regulations, which is the extent of the scope of discovery that has been permitted by the Board. Notwithstanding, and without waiving, the aforesaid objections, University answers as follows: For each day of the period, less than 4700 grams of U-235 enriched more than 20% was in the fuel storage holes. In general, irradiated fuel is either in the core or in the storage pits, and the total quantity of irradiated fuel in the reactor room has not exceeded 4700 grams.

RESPONSE TO INTERROGATORY NO. 4

University objects to this question to the extent that the question seeks to explore operating conditions that may have occurred in the period prior to the adoption of the upgraded safeguards regulations applicable to University's facility which became effective November 21, 1979 on the grounds that such information is not relevant and is not reasonably calculated to lead to the discovery of evidence admissible on the question of the applicability of 10 CFR Part 73 safeguards regulations, which is the extent of the scope of discovery that has been permitted by the Board. Notwithstanding, and without waiving, the aforesaid objections, University answers as follows: To the knowledge, of University's staff for the period since November 21, 1979, no.

(a) Not applicable

(b) Not applicable

(c) Not applicable

RESPONSE TO INTERROGATORY NO. 5

See the objections stated and the response given to Interrogatory No. 4, above.

RESPONSE TO INTERROGATORY NO. 6

The precise dose rate is not determined except that calculations have been made to determine the conditions that would result in an external dose rate of 100 rem per hour at 3 feet, unshielded. The basic calculation is presented in the attached Exhibit "A".

RESPONSE TO INTERROGATORY NO. 7

Not applicable.

RESPONSE TO INTERROGATORY NO. 8

See response to Interrogatory No. 6, above.

RESPONSE TO INTERROGATORY NO. 9

See response to Interrogatory No. 6, above.

RESPONSE TO INTERROGATORY NO. 10

Approximately 14 days.

RESPONSE TO INTERROGATORY NO. 11

Level of operations or schedule of operations or other variations in power history.

RESPONSE TO INTERROGATORY NO. 12

The parameters of the problem have been incompletely described, but in any case, the answer involves a complex calculation that has not been made. See response to Interrogatories Nos. 6,10 and 11, above.

RESPONSE TO INTERROGATORY NO. 13

There are no written rules or procedures. However, the reactor is operated an average 200 KWH per week which provides a conservative operating margin for meeting the self-protecting conditions.

(a) See response above

(b) Specific attention was made to observing the self-protecting conditions beginning in January 1981.

RESPONSE TO INTERROGATORY NO. 14

As a result of the recent reduction in total fuel inventory at UCLA, the University is no longer concerned with maintaining the self-protecting conditions.

(a) through (k), not applicable.

RESPONSE TO INTERROGATORY NO. 15

University agreed to maintain the self-protecting conditions for the "in-core" fuel or to reduce its fuel inventory. The committment was communicated by letter from Wegst to Miller, dated January 29, 1981, attached hereto as Exhibit "B".

RESPONSE TO INTERROGATORY No. 16

Assuming "No. 14" should read "No. 15", the answer is there are no such dates.

RESPONSE TO INTERROGATORY NO. 17

Yes. There are no such procedures; see response to Interrogatory No. 14, above.

RESPONSE TO INTERROGATORY NO. 18

University cannot speculate on such hypothetical situations except to note that there is no requirement to maintain the radiation level given the current fuel inventory at the UCLA facility.

RESPONSE TO INTERROGATORY NO. 19

Not to the knowledge of University's staff but see the Miller to Wegst letter, dated January 12, 1982, attached hereto as Exhibit "C".

RESPONSE TO INTERROGATORY NO. 20

University objects to the question to the extent that the question seeks security information unrelated to radiation dose rate of the irradiated fuel on the grounds that such information is protected information and is not reasonably calculated to lead to the discovery of evidence admissible on the question of the applicability of 10 CFR Part 73 safeguards regulations, which is the extent of the scope of discovery that has been permitted by the Board. Notwithstanding, and without waiving, the aforesaid objections, University answers as follows: With respect to maintaining the self-protecting conditions for the "in-core" fuel, University has never been found in non-compliance with NRC security or safeguard regulations.

RESPONSE TO INTERROGATORY NO. 21

There are no specific dose rate limitations.

RESPONSE TO INTERROGATORY NO. 22

No. During period of major "in-core" maintenance and lower than average operational intensity.

RESPONSE TO INTERROGATORY NO. 23

The precise minimum quantity is unknown.

RESPONSE TO INTERROGATORY NO. 24

The precise maximum is unknown. Under the present configuration with the presently available fuel composition no more than 4 kilograms U-235.

RESPONSE TO INTERROGATORY NO. 25

University objects to the question on the grounds that it is unclear, ambiguons and imprecise in that it seems to require that the University speculate on what regulatory requirements will be in effect throughout the proposed relicensing period. Notwithstanding, and without waiving, the aforesaid objections, University answers as follows: There are no additional facts not provided in response to the interrogatories above.

Dated: August 9, 1982

DONALD L. REIDHARR
GLENN R. WOODS
CHRISTINE HELWICK

By [signature]
William H. Cormier
UCLA Representative

VERIFICATION

Neill C. Ostrander, being duly sworn, deposes and says that he is the Manager of the Nuclear Energy Laboratory of University, The Regents of the University of California; that he has read the annexed "University's Response to Intervenor's First Set of Interrogatories on Contention XX" and knows the contents thereof; and that the same are true to the best of his knowledge, information and belief.

Neill C. Ostrander

Neill C. Ostrander

Subscribed and sworn
to before me this 9th
day of January, 1982

Toni Vogel

Notary Public

OFFICIAL SEAL
TONI VOGEL
NOTARY PUBLIC - CALIFORNIA
PRINCIPAL OFFICE IN
LOS ANGELES COUNTY
My Comm. Exp. Nov. 20, 1985

The conservative (under-estimating) nature of the dose rate calculation resides in the fact that the assumed five year annual power of about 15 Mwh/yr has been exceeded for every year since 1976, and is currently running at a rate greater than 20 Mwh/yr.

Neill C. Ostrander
Nuclear Energy Laboratory
UCLA
July 1982

Fuel Self Protection Calculation

The radiation intensity D at distance r from the core center after an operational history $P(\tau)$ extending over a time interval T followed by a down time t is approximately

$$D = \frac{A}{4\pi r^2} \int_0^T P(\tau)(T + t - \tau)^{-1.2} \, d\tau \; .$$

This formulation assumes that all of the delayed gammas are emitted at the core center, and the numerical calculations assume that three feet from the nearest accessible surface is equivalently four feet from the core center. The constant A depends upon the units chosen but represents the conversion from the energy release $P(\tau)d\tau$ at τ to the incremental dose dD at t.

The precise evaluation of the equation over the entire operating history of the reactor amounts to a summation of all contributions to the integral for those times for which $P(\tau) > 0$. The results shown below are based upon the following simplified model which underestimates the actual radiation level.

1) Neglect all contribution from the history prior to 5 years ago. Thus, today, $\tau = 0$ corresponds to approximately August 1, 1977.
2) Assume 3 years (say 8-1-77 through 7-31-80) at an average uniform power level of 15 Mwh per year.
3) Assume that the subsequent 2 years (say 8-1-80 through 7-31-82) can be characterized by two components:
   a) a periodic component produced by a 200 kwh energy generation (treated as a Dirac delta function) every seven days, and superposed thereupon;
   b) a random, smoothed, average power level of 5.0 Mwh/yr.
   Note that the sum of (a) and (b) is equivalently 15.4 Mwh/yr.

These assumptions lead to the following radiation dose rates at 3 feet from the nearest accessible surface following a shut down of t weeks.

Time, t (weeks)	Dose Rate (R/hr) at 3 feet
1	142
2	107
3	91
4	83

The dates indicated in assumptions (1),(2) and (3) are arbitrary and could have been represented by phrases such as five years ago and two years ago to reflect the moving average aspect of a calculation which is not actually performed on a day-by-day or any other periodic basis.

Exhibit "B"

UNIVERSITY OF CALIFORNIA, LOS ANGELES

UCLA

BERKELEY · DAVIS · IRVINE · LOS ANGELES · RIVERSIDE · SAN DIEGO · SAN FRANCISCO

SANTA BARBARA · SANTA CRUZ

COMMUNITY SAFETY DEPARTMENT
OFFICE OF RESEARCH & OCCUPATIONAL SAFETY
LOS ANGELES, CALIFORNIA 90024

January 29, 1981

James R. Miller, Chief
Standardization and Special Projects Branch
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miller:

In reference to your letter of January 12, 1981: We are scheduling reactor operations to conform with the self-protection criteria for the in-core fuel. As this represents a temporary arrangement, we are proceeding to identify viable options for the reduction of our unirradiated SNM inventory.

Two options have been identified; (1) transfer to the DOE Lawrence Livermore National Laboratory (LLNL), and (2) return to DOE, Idaho Falls. The DOE and LLNL have tentatively indicated the acceptability of either destination, subject to approval of final plans.

Very truly yours,

Walter F. Wegst

Walter F. Wegst, Director
Research & Occupational
Safety

WFW/NCO/lc

Exhibit "C"

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

JAN 1? 1981

Dr. Walter F. Wegst
University of California
at Los Angeles
Director of Research and
Occupational Safety
Office of Environmental
Health and Safety
Los Angeles, California 90024

Dear Dr. Wegst:

Following a site visit and review of your Physical Security Plan by NRC, we have determined that the UCLA reactor operating and SNM storage sites are contiguous. As such the facility must implement interim Category I physical security requirements. These requirements are currently contained in 10 CFR Parts 73.67(a)(b)(c)(d) and 73.60.

In order to be exempt from the above requirements, the fuel in storage would have to be shipped to another location or the reactor would have to be operated to maintain the fuel irradiation level at a dose rate of 100 rem/hr at 3 feet from any accessible surface. (See 10 CFR 73.6(b) and 73.67(b)(1)(i)).

By January 31, 1981, please indicate your confirmation of the above and your plan for compliance with this temporary adjustment.

Sincerely,

James R. Miller, Chief
Standardization & Special
Projects Branch
Division of Licensing

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (UCLA Research Reactor)	))))))	Docket No. 50-142 (Proposed Renewal of Facility License Number R-71

CERTIFICATE OF SERVICE

I hereby certify that copies of the attached: UNIVERSITY'S RESPONSE TO INTERVENOR'S FIRST SET OF INTERROGATORIES ON CONTENTION XX in the above-captioned proceeding have been served on the following by deposit in the United States mail, first class, postage prepaid, addressed as indicated, on this date: August 9, 1982.

John H. Frye, III, Chairman
Administrative Judge
ATOMIC SAFETY AND LICENSING BOARD
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Emmeth A. Luebke
Administrative Judge
ATOMIC SAFETY AND LICENSING BOARD
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Oscar H. Paris
Administrative Judge
ATOMIC SAFETY AND LICENSING BOARD
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Counsel for the NRC Staff
OFFICE OF THE EXECUTIVE LEGAL DIRECTOR
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Chief, Docketing and Service Section
OFFICE OF THE SECRETARY
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Mr. Daniel Hirsch
Cte. to Bridge the Gap
1637 Butler Avenue, #203
Los Angeles, CA 90025

Mr. John Bay, Esq.
3755 Divisadero #203
San Francisco, CA 94123

Mr. Daniel Hirsch
Box 1186
Ben Lomond, CA 95005

Nuclear Law Center
c/o Dorothy Thomson
6300 Wilshire Blvd., #1200
Los Angeles, CA 90048

Ms. Sarah Shirley
Deputy City Attorney
City Hall
1685 Main Street
Santa Monica, CA 90401

W H Cormier

WILLIAM H. CORMIER
UCLA Representative

THE REGENTS OF THE UNIVERSITY OF CALIFORNIA

Questions and Clarification as to "Fuel Self Protection Calculation", by Neill Ostrander, dated July 1982("Exhibit A")

A. As to the equation in sentence 1:

(1) What is the source of the equation?

(a) If the source is a book, article, report or other document, give its title, author, publisher, date, page number, and other appropriate identifying information and indicate why you believe it is the appropriate equation to use.

(b) If derived by your staff or personnel, how was it derived and what assumptions were used in its derivation?

(2) What is the source of the numerical exponential "-1.2", and why is it employed in said equation?

(a) If the source of the exponential is a book, article, report or other document, give its title, author, publisher, date, page number, and other appropriate identifying information and indicate why it is appropriate to use it.

(b) If derived by your staff or personnel, how was it derived and what assumptions were used in its derivation?

(3) What is the value which was used for the constant "A" in the equation, and what are the units in which it is expressed, as used to obtain the results in paragraph 3?

(a) If the source of the constant is a document, please identify the document as above, and indicate why you think it is the appropriate value to use.

(b) If derived, how was it derived, and what assumptions were used in its derivation?

(c) Was the constant obtained by actual measurement or by calculation? What approximations and assumptions are made in so obtaining the constant?

B. As to part 3a of the calculation:

Was the periodic component of 200kW energy generation every seven days assumed to be regular with time or to be variable with time? (i.e., did you assume 200kWh output on day 1, 200kWh on day 8, 200kWh on day 15, etc.; or did you assume, e.g. 100kWh on day 1, 75kWh on day 5, 130kWh on day 16, etc., which would average out to be 200kWh each week?)

C. As to the "random, smoothed, average power level of 5.0 MWh per year" identified in part 3b of the calculation:

(1) Precisely what is meant by "random, smoothed, average"?

(a) Is the power function $P(\tau)$ implied by this sentence a

EXHIBIT F

constant power level of 5MWh per year (i.e., was it "straightlined"?) or was some randomly generated function used for the calculation?

If the power function $P(\tau)$ was not meant by this sentence to be a constant in time, then describe the function used and the means to generate it. Include in the description of the function used in addition to the mean power level, the constants or parameters and their values and units which indicate the temporal characteristics, that is, the rate of change of the function with time, and those that express the amplitude variability and deviation from the average power level.

(b) How was the random power level "smoothed"? Please provide the functions used to smooth it.

D. By the reactor being "shut down", as used in paragraph 3, do you mean zero power generation from both the periodic impulse component and the random smooth component?

(1) Are there any assumptions used in the calculation in question which would make the equation invalid for downtimes of less than one week? If so, please identify said assumptions.

(2) Please provide dose rate estimates for 1 day and 3 days after shut down or for similar T values of less than one week.

E. If the calculation was computer assisted, please provide the computer program and printouts.

(1) For those portions of the calculation not computer assisted, please show the actual calculations that resulted in the dose rate conclusions summarized in the table at the bottom of page 1 of "Exhibit A".

(2) Please provide all other calculations or computer runs, if any, from January 1981 to the present that were conducted to, or that could be used to, estimate operating conditions necessary to maintain the fuel at 100 rem/hr.

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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SANTA BARBARA · SANTA CRUZ

OFFICE OF THE CHANCELLOR
LOS ANGELES, CALIFORNIA 90024

August 26, 1982

Mr. John H. Bay, Esq.
Embarcadero Center
Twenty-Third Floor
San Francisco, California 94111

Dear Mr. Bay:

In response to our agreement reached over the telephone on August 18, 1982 and recorded in your letter to me of the same date, I have enclosed the following information:

- a table representing the fuel inventory by various category at the UCLA facility since 1970 contained in memo, Ostrander to Cormier; and

- answers to the written questions on the "Fuel Self-Protection Calculations" which you had hand-delivered to my office on August 23rd; these questions were essentially follow-up questions to our interrogatory responses of August 9th.

I trust that you will find our responses to your discovery requests both complete and timely.

Very truly yours,

William H Cormier

William H. Cormier
UCLA Representative

Enclosure

cc: Service List

EXHIBIT G

MEMORANDUM

25 August 1982

TO: W. Cormier
2241 Murphy

FROM: N. Ostrander
2567 Boelter Hall

SUBJ: NEL Fuel Inventory Since 1970

I have constructed the attached inventory record for your response to Mr. Bay's request of August 18, 1982. Inventorial practices have changed over the several AEC-ERDA-NRC administrations and even within the lifetime of the NRC. The general trend has been to add detail by distributing inventory into an increasing number of categories. Descriptive words have been replaced by a three symbol code. There have been several generations of such codes, and no assurance that they are one-for-one translatable. For example, one can translate "encapsulated, enriched, unirradiated, uranium-alloy scrap" into the category "uranium" but the inverse transformation is not possible.

All of this goes to say that I have made a best effort to provide a complete record, but I have had to make some interpretations based upon continuity of category by continuity of numbers. I cannot attest to the absolute accuracy of the record. I think it is a reasonable, but not necessarily unique interpretation of the available records.

INVENTORY OF U-235 ISOTOPE IN FUEL, kg

DATE	Irradiated Fuel		Fresh Fuel		TOTAL
	In-Core	In Pits	Useful	Scrap	
3-31-70	3.50	-	-	0.02	3.52
6-30-71	3.50	-	2.53	0.02	6.05
12-31-71	3.56	0.73	3.74	0.94	8.97
12-21-74	3.55	0.73	3.74	0.60	8.62
9-30-80	3.53	-	3.74	0.60	7.87
9-30-81	3.53	-	3.75	-	7.28
8-25-82	3.53	-	1.39	-	4.92

Except for the small burn-up (~ 1 gm per year), the inventories are constant over any interval between adjacent dates. E.g., from 12-31-74 to 9-30-80, the total inventory was approximately 8.62 kilograms. The dates are inventorial record dates and not the actual dates of the material transfer.

FUEL SELF PROTECTION CALCULATION

Response to Intervenor's questions, Bay to Cormier, 8/23/82

A. (1) The equation was synthesized from several source documents and physical principles.

(a) 1. Effects of Atomic Weapons, S. Glasstone (ed.), U.S. Government Printing Office, 1950, pages 251 and 13.

2. Nuclear Power Systems, Gregg-King, MacMillan Co., 1964, page 169.

(b) Equation 8.12.2 of Reference 1 for a nominal bomb can be converted to gamma ray energy rate (mev/sec) per kwh using the equivalences of page 13 of Reference 1. The gamma ray energy is assumed to be isotropically emitted by a point source to yield an energy flux I • E in mev/sec per cm^2 at distance r (cm) from the point source (the $1/4\pi r^2$ factor). The conversion of gamma ray energy flux to radiation units is given in Reference 2.

(2) The exponent arises from the decay law expressed by equation 8.12.2 of Reference 1. It is a commonly used, simple expression. Neither of the cited references is particularly unique, they happened to be the ones I used.

(a) See above.

(b) See above.

(3) With power in kilowatts, r in centimeters, and dose rate in r/hr, and all times in hours; the constant is approximately 1.18×10^7. The calculations were performed with $A/4\pi r^2 = 63$.

The constant follows from the cited references and the appropriate conversion of units, primarily one hour equals 3600 seconds.

(a) See above.

(b) No additional assumptions were made.

(c) It was not measured. See above.

B. The component was strictly periodic in time and amplitude--200 kwh at 168 hour (one week) intervals.

C. (1) As used in the calculation, the random components of actual operations appear in the calculation as a constant (smoothed) average, $P(\tau)$ = constant.

(a) See above.

(b) It was "smoothed" by using an average value lower than any annual average value of the post-1976 era.

D. Yes.

(1) Yes. The equation is not valid as $t \rightarrow 0$, and does not describe the transition from the operating state to the shutdown state. The equation is said to be fairly accurate for $t > 100$ seconds (ANL 5800, 2nd Ed., USAEC, July 1963, page 634-635).

(2) The calculation has not been done, but the decay law with $n = -1.2$ could yield no lower values than those calculated for one week.

E. All calculations were performed with a hand-held Hewlett-Packard, HP-25. The computer is programable but non-printing. There are no printouts. I did not save any program.

(1) Almost all engineering calculations are "computer assisted," whether by analog slide rule or IBM machine. The evaluation of the integrals involved under assumptions 2) and 2)b) with $P(\tau)$ constant, is straight forward algebra and I do not recall precisely how I evaluated the algebraic solution. Assumption 2)a) was treated by summing a series of 104 terms. Each incremental contribution was accumulated in the computer memory without recording the partial sums. The contributions arising from assumptions 2, 3a, and 3b were:

τ	r/hr			
(weeks)	2	3a	3b	Total
1	6	97	39	142
2	6	70	31	107
3	6	59	26	91
4	6	52	25	83

(2) No previous calculations were formalized or retained.

Neill C. Ostrander
8/25/82

Fuel Self Protection Calculation

The radiation intensity D at distance r from the core center after an operational history $P(\tau)$ extending over a time interval T followed by a down time t is approximately

$$D = \frac{A}{4\pi r^2} \int_0^T P(\tau)(T + t - \tau)^{-1.2} d\tau.$$

This formulation assumes that all of the delayed gammas are emitted at the core center, and the numerical calculations assume that three feet from the nearest accessible surface is equivalently four feet from the core center. The constant A depends upon the units chosen but represents the conversion from the energy release $P(\tau)d\tau$ at τ to the incremental dose dD at t.

The precise evaluation of the equation over the entire operating history of the reactor amounts to a summation of all contributions to the integral for those times for which $P(\tau) > 0$. The results shown below are based upon the following simplified model which underestimates the actual radiation level.

1) Neglect all contribution from the history prior to 5 years ago. Thus, today, $\tau = 0$ corresponds to approximately August 1, 1977.
2) Assume 3 years (say 8-1-77 through 7-31-80) at an average uniform power level of 15 Mwh per year.
3) Assume that the subsequent 2 years (say 8-1-80 through 7-31-82) can be characterized by two components:
   a) a periodic component produced by a 200 kwh energy generation (treated as a Dirac delta function) every seven days, and superposed thereupon;
   b) a random, smoothed, average power level of 5.0 Mwh/yr.
   Note that the sum of (a) and (b) is equivalently 15.4 Mwh/yr.

These assumptions lead to the following radiation dose rates at 3 feet from the nearest accessible surface following a shut down of t weeks.

Time, t (weeks)	Dose Rate (R/hr) at 3 feet
1	142.
2	107.
3	91
4	83

The dates indicated in assumptions (1), (2) and (3) are arbitrary and could have been represented by phrases such as five years ago and two years ago to reflect the moving average aspect of a calculation which is not actually performed on a day-by-day or any other periodic basis.

The conservative (under-estimating) nature of the dose rate calculation resides in the fact that the assumed five year annual power of about 15 Mwh/yr has been exceeded for every year since 1976, and is currently running at a rate greater than 20 Mwh/yr.

Neill C. Ostrander
Nuclear Energy Laboratory
UCLA
July 1982

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (UCLA Research Reactor)	Docket No. 50-142 OL (Proposed Renewal of Facility License)

DECLARATION OF DANIEL O. HIRSCH

I, Daniel O. Hirsch, declare as follows:

1. On August 13, 1982, I had a telephone conversation with Mr. C.K. Nulsen of the U.S. NRC.

2. A copy of a memorandum I prepared that day regarding the conversation is attached hereto.

3. Said memorandum represents a true and correct summary of my conversation.

I, Daniel O. Hirsch, swear under penalty of perjury under the laws of the United States that the foregoing is true and correct to the best of my knowledge and belief.

Executed on September 5, 1982
at Ben Lomond, California

Daniel O. Hirsch
Daniel O. Hirsch

EXHIBIT I

10 CFR 73.60 vs. .67 100 R/hr exemption

August 13, 1982

I spoke today by phone with Mr. G. K. Nulsen, 301-427-4181, who is listed in SECY-81-376A as the contact person for proposed regulation amendments to 10 CFR 73.67, security for non-power reactors' SNM.

He said he is no longer working on that project, but that the proposals have been revised and are soon to be published for another round of public comment. Final rule would thus be some time away.

He said that the <u>current</u> rule regarding exemption for 100 R/h SNM is per fuel element, <u>not</u> the entire core. The reason the proposed rule looked at the TRIGA cluster was a question as to whether it was "readily separable." All other fuel would be, and is, based on 100 R/hr for each discrete fuel element, i.e. each bundle that can be readily removed. Thus (dh) it is clear that each of the 24 Argonaut fuel bundles must meet the 100 R/hr standard.

A new Reg Guide to be published with the proposed rule, when adopted, will make that clear, but it is currently the policy and is understood as such within NRC, he says.

The new rule may average the dose across the core--i.e. take the average dose of each fuel element, as opposed to requiring x that each element meet the 100 R limit; i.e. a few elements might be at 85 while all the rest are at 150, and under the new rule the facility would still be exempt (although not now.)

SPECIAL NUCLEAR MATERIAL SELF PROTECTION CRITERIA INVESTIGATION

SUMMARY

Los Alamos National Scientific Laboratory was tasked by the Nuclear Regulatory Commission to examine the technical aspects of exempting from certain physical protection requirements SNM possessed by nonpower reactor licensees due to its radiation levels. In addition, the Laboratory was tasked to consider alternatives to the 100 rem/hour standard. The "100 rem/hr at a distance of 3' from any accessible surface without intervening shielding" exemption was established to provide a deterrence against theft of SSNM.

The Los Alamos study found no strong technical basis for changing NRC policy on the 100 rem/hour exception. In Phase I of the study, six areas of concern were identified as impacting the criterion. A summary of the discussions and conclusions of Phase I of the study for each concern is given below.

1. Analysis of the equipment, expertise, and time required to remove fuel from the core of nonpower reactors.

   This discussion is based upon removal of irradiated fuel from open pool-type reactors. The open pool-type represents a worse-case situation in comparison to tank-type reactors which have inherent safeguards, i.e., massive shielding plugs requiring cranes for removal. The minimum equipment required to remove fuel from an open-pool reactor includes a fuel handling tool, a truck and radiation shielding. The fuel handling tool could be the simple fabrication of a hook on the end of a rope. The size of the truck or transport vehicle is determined by the amount of shielding the adversary decides is necessary. Five kilograms of uranium in plate-type fuel or TRIGA fuel can be stored in a 0.6 mx 0.6mx 1m volume. The simplest form of shielding in a vehicle is concrete block. Attenuation factors of 10 or 100 could be provided in a small moving truck or heavy duty pickup or van by providing 910 Kg or 1820 Kg of concrete block shielding, respectively. The probability of successful theft would be further increased with the assistance of a knowledgeable insider. Such an individual may have knowledge of type and location of fuel, and operation of intrusion alarm detectors. The time required to complete a successful theft depends on many factors including people involved, equipment used, shielding used, distance from the fuel storage area to the vehicle, etc. Assuming that reactor security has been breached by a group of two or three, a knowledgeable estimate of time for removal of 5 Kg of fuel from the core and storage, load it into a vehicle by hand and depart is 3.5 hours. This time could probably be minimized to one to two hours if additional inside manpower is utilized. This assumes no early detection of and interference with the theft occurs.

2. Estimate the range of doses likely to be received by an adversary in attempting to remove material.

   The most likely dose a careful group of adversaries will receive in attempting to remove 5 Kg of uranium is in the 50 to 100 rem range. This

 EXHIBIT J Inclosure B

estimate assumes the following: a) a person with a grappling hook pulling fuel from a storage pool, b) 30 elements moved, c) mean exposure time to a single element in air - 1 minute, d) mean exposure time to elements stored in truck - 1 minute, e) no shielding for single elements, f) shielding in truck to reduce dose by a factor of 100, g) dose rate 100 rem per hour per element and h) 30 minute drive in truck. This range is not an incapacitating dose especially when distributed among several people. Maintaining an incapacitating dose (est. 10,000 rem/hr at 3 feet) is not a practical alternative for most nonpower reactors.

3. The technical feasibility of providing tamper-proof radiation detection to prevent the theft of irradiated NPR fuel.

   Tamper-proof radiation detectors offering the following capabilities (with slight modification) are commercially available and are a feasible approach:

   a. alarm at an off-site location if the radiation exceeds a present level,

   b. alarm at an off-site location if an attempt is made to change the alarm set point or to disable the device,

   c. not shielded readily,

   d. not interfere with the normal operation of the facility, and

   e. offer an advantage to nonpower reactors as compared to maintaining fuel at 100 rem/hr.

4. Evaluation of the physical separability of fuel elements before the theft of various NPR fuels.

   Physical separability refers to the physical breakdown of a fuel element assembly into fuel elements. Three types of assemblies are of concern: 1) plate-type fuel element assemblies normally containing 10-20 plate-type fuel elements, each swaged into end pieces, 2) four rod cluster TRIGA fuel assemblies and 3) special containers constructed to contain elements that do not meet the self-protection criteria. These fuel element assemblies are not considered separable for the following reasons: 1) to achieve significant dose reduction, the assemblies must be separated under water which would require the design of special tools, 2) the adversary gains nothing by separating the assemblies because although each piece is not as radioactive as the whole, the adversary must handle more pieces and 3) the adversary increases his probability of detection because of the additional time expended in separating the assemblies.

5. The appropriateness of using radiation levels based on a deterrence rather than an incapacitating dose.

It is apparent and documented through actual experience that in order to assure a true "immediate incapacitation dose" to a group of adversaries, the dose rate per element must reach approximately several thousand rem at three feet. Increasing the self protection value above 100 rem/hr at three feet is beyond the capability of nearly all nonpower reactors for any significant decay times. Therefore, the study concludes that the determination of radiation levels based upon deterrence are more appropriate than those based upon incapacitating dose.

6. Estimation of the quality and quantity of SSNM that will be allowed relative to the definition of "formula quantity."

   The NRC defines a formula quantity as U-235 (contained in uranium enriched to 20% or more in the U-235 isotope), uranium-233 or plutonium alone or in any combination in a quantity of 5000 grams or more computed by the formula, grams = (grams contained U-235) + 2.5 (grams U-233 + grams plutonium). This formula puts the same significance on 20% enriched fuel as it does 93% enriched fuel. The functional relationship between critical mass and enrichment has been well documented and variation of enrichment should be used in criterion related to the construction of a critical device.

   Furthermore, the 100 rem/hr dose level is used without reference to quantity of U-235. Five kilograms with a dose rate of 100 rem/hr is treated the same as ten 0.5 kg sources, each with a dose rate of 100 rem/hr. In the latter case, one would have to handle all of the pieces of SNM and be exposed to ten times the dose involved in the former case. Therefore, the amount of fuel per fuel element should be considered in the self-protection criterion.

Phase II of the Los Alamos National Scientific Laboratory study examined alternatives other than the present exemption criteria of 100 rem/hr or more at 3 feet. The alternatives and their advantages and disadvantages are summarized below. Although the study indicated some relationship to preference in the ordering of the alternatives, there was no attempt to conclude that one alternative was better than any of the others.

1. <u>Exemption Based on Integrated Dose</u>. For this alternative, the rule would be written to specify that an adversary removing the SSNM would receive a given amount of radiation in so doing.

   a. Advantages.

      (1) The rule can be written to allow flexibility in dose estimates based on the facility design.

      (2) Would be advantageous to those sites having a large distance between the fuel and the location of the removal vehicle.

      (3) Would be advantageous to those sites which have additional barriers, doors or other hindrances which increase the time to move the material from its location to the removal vehicle.

b. Disadvantages.

(1) This alternative has little physical significance.

(2) Could conflict with the ALARA standard depending on how the dose is set.

2. Exemption Based on Detection. For this alternative, the rule would be written requiring that an alarm signal be transmitted to a security force if an attempt is made to remove radioactive material from the facility.

a. Advantages.

(1) Will allow fuel to be kept at the lowest possible level of radiation depending on the location of the detectors and thus meets ALARA standard.

(2) Allows flexibility to the facility.

b. Disadvantages.

(1) Depends on ability to implace detectors that can not be overridden by an adversary group or an insider.

(2) Facility must demonstrate that alarm system is tamper-proof and will detect the unauthorized removal of material.

3. Retain the 100 rem/hr Exemption but give Credit for Fuel Enrichment and Mass. For this alternative; the rule would be written to take into account the fuel form, the enrichment or the connection between the dose rate and the quantity of fuel. This would take into account that an adversary forced to move more fuel of a given dose rate would receive more of a dose than if he moved less fuel at the same dose rate. If we were to select as our basis a reactor that contained fuel elements with a mass of 175 grams, then a formula of $\frac{100 \text{ rem/h}}{175 \text{ g.}} XmE^2 = .57mE^2$ rem/hr at 3 3 ft would be used to determine the required dose rate for an exemption. (E is the fractional enrichment, and m is the U235 mass in grams of the fuel element at the NPR under consideration where the fuel element used as a basis has a mass of 175 grams.)

a. Advantages.

(1) Includes fuel form in regulation.

(2) Is closer to a function of real world exposure than other alternatives.

b. Disadvantages.

(1) Facilities with greater than 175 g. fuel elements will be required to maintain radiation greater than 100 rem/hr.

(2) Is contrary to ALARA standards.

4. Retain 100 rem/hr Exemption as Presently Specified in 10 CFR 73.67(b) and 10 CFR 73.6(b). This alternative is the rule that presently applies to NPRs. Most of the NPRs have adjusted their inventories and procedures to accommodate this rule.

   a. Advantages.

      (1) No additional action required by NRC.

      (2) No additional action required by facility.

   b. Disadvantages.

      (1) To meet the standard is difficult for some facilities.

      (2) The standard is not a physical deterent.

      (3) It is contrary to ALARA.

      (4) Makes facilities more attractive for sabotage.

5. Exempt Irradiated Fuel. For this alternative, the rule would be written to exempt all fuel that has been irradiated in a reactor. This was the rule in 10 CFR 73.50 in the past but it was questioned because it had little physical basis.

   a. Advantages.

      (1) It would be a psychological deterence.

      (2) Does not require that dose rate be measured.

      (3) Meets ALARA standards.

      (4) Will allow fuel to cool below 100 rems/hr and thus reduces danger of sabotage.

   b. Disadvantages.

      (1) No physical basis for rule.

      (2) Dose received by adversary could be very low.

In conclusion, there appears to be insufficient reason to increase the level of radiation in order to exempt nonpower reactors from Category I requirements. The alternatives suggested by Los Alamos Scientific Laboratory are such that even less than 100 rem/hr at 3 feet can be sufficient. However, it would be contrary to international agreements to adopt less than 100 rem/hr. Since there is insufficient evidence to support a change from the 100 rem/hr, and since more technical evidence should be available to change a regulation, the 100 rem/hr at 3 feet exemption for irradiated fuel should be maintained.

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 OL
	)	
	)	(Proposed Renewal of Facility License)
(UCLA Research Reactor)	)	

DECLARATION OF ROGER L. KOHN in Support of Intervenor Committee to Bridge the Gap's Brief on the Applicability of Physical Security Regulations to this Licensing Proceeding

I, Roger L. Kohn, declare as follows:

1. I am presently a third-year law student at UCLA School of Law, and expect to receive a J.D. degree in May 1983.

2. I am also a physicist and systems analyst. I received a B.A. degree with honors in physics from Haverford College in 1963, and M.S. and Ph.D. degrees from Stanford University in 1965 and 1968, respectively. I have completed coursework and employment in both experimental and theoretical nuclear physics, and have had twenty years experience in various applications of physics, mathematics, and computer programming. My professional resume, giving my credentials prior to law school, is attached.

3. I have read University's Response to Intervenor's First Set of Interrogatories on Contention XX, August 9, 1982, and Neill C. Ostrander's Fuel Self Protection Calculation dated August 25, 1982, attached to UCLA Representative William H. Cormier's response letter of August 26, 1982.

4. Assuming the values, assumptions, approximations, and equations used in the first two paragraphs of Exhibit "A" of University's Response to Intervenor's First Set of Interrogatories on Contention XX (hereinafter cited as Exhibit "A") or cited in Neill C. Ostrander's Fuel Self Protection Calculation dated 8/25/82, to be correct, I have constructed a calculator program which is capable of calculating dose rates for various times following shutdown. The program produces substantially the same dose rates at delay times of 1, 2, 3, and 4 weeks as those given in paragraph three of Exhibit "A".

5. The match is appreciably better if I assume that the delta-function energy pulse occurs at the end of each week rather than, say, at the beginning of each week (i.e., if the reactor is shut down immediately after a delta-function energy pulse rather than if it is shut down

just before the next one is due). Neither Exhibit "A" nor the 8/25/82 response letter indicates which assumption was made in the model used to produce the numbers in paragraph three of Exhibit "A". I then used this same program to calculate dose rates for delays other than 1, 2, 3, or 4 weeks.

6. The figures in Exhibit "A" are relevant for doses from the (presumed) entire unshielded reactor core. However, on the assumption that the appropriate dose relevant to theft is the dose from a single detached fuel bundle of the twenty-four total bundles in the core, the doses must be redetermined. The Exhibit "A" calculation assumed exposure at a distance of three feet from the core surface and thus four feet from the core center. It also apparently approximated the dose as originating entirely at the core center instead of distributed throughout the core. (It is likely, according to my calculations, that this last approximation will indeed cause less than a ten percent error.)

7. I have assumed in subsequent calculations that, upon separating a single one of the twenty-four core fuel bundles from the remainder of the core, one-twentyfourth of the radioactivity accompanies the bundle. It is possible that in fact some bundles are more radioactive than others at the time of a shutdown. In the absence of any data in the supplied information regarding radioactivity distribution in the core, I have assumed the distribution to be homogeneous. This is conservative with respect to fuel self-protection since the thief, equally uninformed, might reasonably assume the outer bundles to be safest and remove them; my assumption of homogeneity produces a bundle dose rate higher than these possibly below-average outer-bundle dose rates.

8. The exposure due to a single fuel bundle at a distance of three feet from that bundle will then be less than that due to the whole core by a factor of twenty-four; but it will also be greater by a factor of $(4/3)^2$ due to the decreased distance to the center of the radiating source, assuming (as does Exhibit "A") that all radiation equivalently originates at the source center.

9. My results are as follows (please see next page):

time after shutdown	seconds							100
	hours						8	
	days	28	21	14	7	1		
dose rate, r/hr at three feet	Exhibit "A" whole core (for comparison)	83	91	107	142			
	core, end-of-week pulse	88	98	114	149	452		
	core, beginning-of-week pulse	83	91	102	122	174		
	single fuel bundle, end-of week pulse					33.5	92	
	single fuel bundle, beginning-of-week pulse							34

10. All other things being equal, it is more conservative to assume pulses in the beginnings of the weeks, since this yields lower dose rates. The conservative single fuel bundle dose at three feet is only (approximately) 34 r/hr at the shortest delay following shutdown for which the equation in Exhibit "A" is valid, i.e. 100 seconds. For the least conservative situation, i.e. where the reactor is shut down immediately after a delta-function energy pulse, a dose rate of 100 r/hr at three feet occurs for a single fuel bundle only following delay times after shutdown of less than approximately eight hours.

11. If the weekly-period model is used in lieu of an actual operating schedule, the safest assumption would be the conservative one, i.e. that each week's non-constant fraction of the reactor energy is generated early in the week, and that if the reactor is suddenly shut down and the fuel bundles removed, the energy for the most

recent week was generated nearly a week previous to that shutdown. In such a case, using the same numbers, equations, and approximations as those in Exhibit "A" and the subsequent letter, a single detached fuel bundle cannot be considered theft-proof by virtue of a sufficiently high dose rate, to wit, one of at least 100 r/hour at three feet.

12. The weekly-periodic function assumed in Exhibit "A", 3a), is only a reasonable, conservative approximation to the real operation if the reactor is in fact operated to generate at least 200 kWh of energy in each of the weeks preceeding the shutdown.

13. I have not at this time independently verified the accuracy or applicability of the equation and numbers supplied by Exhibit "A" and the subsequent letter. I here only determine the dose rate from a single detached fuel bundle based on their assumed accuracy and applicability to the whole core.

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

Executed on September 4, 1982, at Manhattan Beach, California

Roger L. Kohn

Roger L. Kohn, Ph.D.

ROGER L. KOHN

524 Eleventh Street, Manhattan Beach, CA 90266
(213) 379-3956

Education:

Ph.D.	Applied Physics	1968	Stanford University	1963-1968
M.S.	Applied Physics	1965	Stanford, California	
B.A.	Physics (Honors)	1963	Haverford College Haverford, Pennsylvania	1959-1963

Professional experience:

- Research and development
  - Laboratory experiments
  - Computer simulation
- Systems and mission analysis
  - Performance analysis
  - Test design and evaluation

Fields of specialization:

- Laser and optical systems and applications
  - Communication
  - Atmospheric propagation
  - Object detection, tracking, and ranging
  - Atmospheric pollution measurement
  - Image transmission and display
- Lasers and optical devices
  - Solid-state, gas, and vapor-phase lasers
  - Dye lasers and fluorescence spectroscopy
  - Short optical pulses, modulation, and mode-locking
  - Photodetectors
  - Deflectors and scanners
  - Retroreflectors
  - Frequency doublers and nonlinear effects
  - Xerography and electrophotography
- Electronic devices
  - Gaseous discharges
  - Nuclear-particle detectors

Roger L. Kohn (cont'd)

Employment:

Pacific-Sierra Research Corporation 1456 Cloverfield Boulevard Santa Monica, California 90404	Senior Scientist 1978 - 1980

Responsible for performance analysis, and design, supervision, and evaluation of tests of optical systems and components. Specifically, laser rangefinders and trackers have been modeled, the effects of atmospheric turbulence and aerosol scatter analyzed, and interesting targets characterized. The utility of various lasers-- tunable dye, neodymium, and carbon dioxide-- for use in such applications as air to ground, air to sea, and ground to ground has been investigated. Key individual components have been studied and, in some cases, characterized through laboratory measurements. These optical elements include heterodyne detectors, wide-field optical filters, visible and infrared lasers, and retroreflective devices. Changes in device or system designs or test procedures are recommended through agency or contractor personnel briefings and reports.

The Aerospace Corporation Electronics Research Laboratory El Segundo, California (P.O. Box 92957, Los Angeles, CA 90009)	Member of Technical Staff 1973 - 1978

Involved in laser research, development, and the application of optics and lasers to mission-oriented programs. Responsibilities included development of new concepts and devices, conducting of laboratory projects, maintenance of expertise on present and future lasers, systems, and applications, and briefing of agency personnel.

Laser research included study of new dye and vapor-phase lasers with emphasis on small-scale, visible devices, and the investigation of laser noise sources. Applications of optics included the measurement of atmospheric pollutants, transmission spectrum of the atmosphere, and the analysis of precision rangefinders for satellite positioning (e.g. for proposed solar-power stations). Laser lifetime tests were designed for the USAF communication satellite program. Novel concepts were pursued: small particles were levitated by radiation pressure with the aim of rotating the suspended beads for numerous research and device purposes.

Bell Laboratories Active Optical Device Department Murray Hill, New Jersey 07974 and Coherent Optics Research Department Holmdel, New Jersey 07733	Member of Technical Staff 1968 - 1972

Roger L. Kohn (cont'd)

Conducted research into fluorescence and lasing properties of dyes and their interactions, excitation, and decay. Computerized data processing and automated spectroscopic equipment were developed to assure reliable results.

Proposed and developed a unique continuously-operating dye laser, independently of other groups previously equipped and working toward this goal, and introduced fundamental design now incorporated in all commercial and most experimental cw dye lasers.

Involved in the development of a high-resolution facsimile recording system, including research and development in gas-discharge and laser image recording, optics and deflection devices, and laser image scanners (the proprietary nature of this work precluded publication).

Microwave Laboratory W.W. Hansen Laboratories of Physics Stanford University Stanford, California 94305	Research Assistant 1963 - 1968

Conducted research into the mechanism and applications of mode-locking of ruby lasers. A model for phase- and amplitude-modulated transient mode-coupling of lasers was developed and computer calculations compared with experimental results. Mode-locking was proposed and shown to increase nonlinearly-generated power, and second-harmonic enhancement was used to study locking.

Experimental Reactor Division Los Alamos Scientific Laboratory Los Alamos, New Mexico	Research Assistant 1963 (summer)

Research involved the study of gamma-ray noise mechanisms in nuclear-particle detectors in the vicinity of nuclear reactors.

Bell Telephone Laboratories Murray Hill, New Jersey	Technical Aide 1961 (summer)

Continued the development and testing of a newly-devised nuclear-particle detector.

Radiation Laboratory Johns Hopkins University Baltimore, Maryland	Laboratory Assistant 1959, 1960 (summer)

Modified, calibrated, and operated an infrared spectrometer.

Roger L. Kohn (cont'd)

Publications:

"Internal Modulation of Ruby Lasers and Second-Harmonic Generation," 1966 International Quantum Electronics Conference, Phoenix, April, 1966 (with R.H. Pantell).

"Second-Harmonic Enhancement with an Internally-Modulated Ruby Laser," Appl. Phys. Letters 8, 231 (1 May 1966) (with R.H. Pantell).

"Mode Coupling in an External Raman Resonator," Appl. Phys. Letters 9, 104 (1 August 1966) (with R.H. Pantell, B.G. Huth, H.E. Puthoff).

"Mode Coupling in a Ruby Laser," IEEE J. Quantum Electr. QE-1, 306 (August 1966) (with R.H. Pantell).

"Mode-Coupling Effects with Ruby Lasers," Ph.D. Dissertation, Stanford University, May 1968; Microwave Laboratory Report 1636.

"An Intracavity-Pumped CW Dye Laser," Opt. Commun. 3, 177 (May 1971) (with C.V. Shank, E.P. Ippen, A. Dienes).

"Observation of Inhomogeneity in the Gain Spectrum of a Coumarin Laser Dye," Opt. Commun. 7, 309 (April 1973) (with C.V. Shank, A. Dienes).

"Characteristics of the 4-Methylumbelliferone Laser Dye," IEEE J. Quantum Electr. QE-9, 833 (August 1973) (with A. Dienes, C.V. Shank).

"Automated System for Measuring Gains in Organic Dyes," Appl. Opt. 12, 2939 (December 1973) (with C.D. Lingel, C.V. Shank, A. Dienes).

Aerospace Corporation technical reports

"Laser Transmitter for NASA Satellite Rangefinder," 8 May 1974.

"Laser Trimming of Precision Resistors for Aerospace Applications," 17 October 1974.

"Angular Acceleration of Neutral Particles with Laser Radiation," 15 October 1975 (with M. Birnbaum).

"Low Frequency Pulsation Noise in Continuous Argon-Ion Lasers," 24 October 1975.

"Short-Range Satellite-to-Satellite Lidar: Cooperative vs. Uncooperative Targets." 3 February 1976.

Roger L. Kohn (cont'd)

"Retroreflectors for Precision Optical Ranging," 17 February 1976.

"Laser Rangefinder for Use with Satellite Elements of Adaptive Stationkept Array," 30 July 1976.

"Aerospace 405B Laser Communications Laboratory," 13 October 1976.

"Measurement of Off-Axis Beam Intensity of 405-B Downlink," 7 January 1977.

"Dye Laser for KrF-Pumped Formaldehyde Isotope-Separation Applications," 15 August 1977.

"Cerenkov Radiation in Optical Systems," 22 August 1977.

Pacific-Sierra Research Corporation technical reports

"Considerations for a Narrowband Optical Filter for ODCS," July 1978.

"Initial Assesment of OCCULT Performance," July 1978 (with R. Lutomirski).

"Compass Hammer Parametric Tests. Part I," September 1978

"Application of an OCCULT-Type Laser System to an Electro-Optical Countermeasure," April 1979

"Geometric Considerations when Using an Optical Scintillometer," January 1979.

"Measurement of Plastic Retroreflector Arrays for Some Radiometric Applications," March 1979.

Patents:

"Dye Laser with Pump Cavity Mode Matched to Laser Resonator" Inventor: R.L. Kohn. #3 766 488, October 16, 1973.

Others submitted to employers for further action.

Roger L. Kohn (cont'd)

Professional affiliations:

American Physical Society, IEEE, AAAS, Sigma Xi.

Personal data:

Born - 1 December 1941, Baltimore, Maryland

Citizenship - U.S.A.

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (UCLA Research Reactor)	)	Docket No. 50-142 OL (Proposed Renewal of Facility License)

DECLARATION OF DAVID W. HAFEMEISTER

I, David W. Hafemeister, declare as follows:

1. I am presently Professor of Physics at the California Polytechnic University in San Luis Obispo, California. My professional qualifications are attached.

2. During the period 1975-1979, I was intimately involved with the development and administration of this nation's nuclear non-proliferation policy, both in the U.S. Senate and in the U.S. State Department. This work included domestic and foreign policy matters related to the use of High Enriched Uranium (HEU) in research reactors and methods to reduce the associated proliferation risks.

3. The proliferation risk associated with HEU is that it can be used directly to make nuclear weapons, unlike the low enriched uranium used, for example, in power reactors. No further enrichment, generally very costly and difficult, would be necessary in order to utilize the material in a clandestine fission explosive, thus making it a potentially attractive target for theft or diversion. For this and related reasons, it has been the policy, both nationally and internationally, to attempt to minimize the amount of HEU in use.

4. 93% enriched uranium in flat plate Aluminum-Uranium fuel would clearly fit within the category of Highly Enriched Uranium. In fact, 93% would be near the upper limit of HEU normally used in reactors, and is clearly "weapons-grade." That is, it could be used directly to fashion a clandestine fission explosive. Furthermore, because the critical mass goes down as enrichment goes up, one would need significantly less U-235 if 93% enriched than, say, 20%, for which the critical mass of U-235 is roughly three times as large. Thus, 93% enriched uranium poses significant proliferation risks and requires significant safeguards if its use is essential.

EXHIBIT L

5. The prevention of nuclear proliferation is a matter which has long been recognized as essential to U.S. interests and the common defense and security. The solutions to nuclear nonproliferation are not simple: The office of Technology Assessment report on Nuclear Proliferation (1977) says that:

> It is not too late to contain proliferation at a level which can be assimilated by the international political system. However, there are no single or all-purpose solutions; no short-cuts. A viable nonproliferation policy will require the coordinated, planned use of a wide variety of measures...

6. In recognition of the threat to common defense and security posed by nuclear weapons proliferation, the Congress passed (virtually unanimously) the Nuclear Nonproliferation Act of 1978. And, beginning in 1977, the United States Government established a policy designed to reduce the threat of proliferation by attempting to reduce the risk of theft or diversion of HEU, in part by attempting to reduce the amount of HEU in use throughout the world, particularly for research reactors. This policy of reducing the threat of theft or diversion by reducing the amount of HEU available for theft or diversion has had as a concommitant element the attempt to reduce the enrichment of research reactor fuels. This program, known as the Reduced-Enrichment Research and Test Reactor Program (RERTR), represents the official policy of the United States in attempting to reduce enrichments of research reactor fuels and thus the amount of HEU in use.

7. The summary report of the International Nuclear Fuel Cycle Evaluation (1980) has stated that it is feasible to markedly reduce the uranium enrichment of a great majority of research reactors; INFCE endorsed the conversion of HEU fueled research reactors to lower enrichment. As C. Worthington Bateman, Acting Under Secretary of Energy in 1980, testified to the Congress that with fuel fabrication technology presently available in the U.S. and Europe enrichment reduction is possible for a great many reactors. And John M. Deutch, then-Director of Energy Research at DOE, told Congress in 1979 that fuel fabrication and core technology currently available in the U.S. and Europe permits enrichment reduction from 90-93 percent to below 20 percent in most reactors. Mr. Bateman indicated in his testimony that the easiest reactors to make use of reduced enrichment fuels are low power reactors. The Department of Energy's NASAP Program stated in 1980 that for those reactors where conversion using current technology might be difficult, substitution of higher uranium density fuels with lower enrichment should be possible. In this way the density (g/cc) of U-235 would remain essentially a constant, but the additional U-238 atoms would dilute the U-235 so that it would be less useable as a material for nuclear weapons.

8. Given the official U.S. policy of reducing the amount of HEU in use to that absolutely essential, and the policy of reducing research reactor fuel enrichments, it is my opinion that UCLA's request for a license for 93% enriched fuel should not be granted unless the applicant can show definitely that it cannot adequately operate the reactor without HEU of that enrichment.

9. Likewise, UCLA's request for a license to possess, as I understand it, 9400 grams of U-235 at 93% enrichment seems to me to necessitate a very substantial showing on the Applicant's part why such a very large amount of such sensitive material could ever be needed on site. If it is true that the core loading is about 3600 grams, it seems to me an unnecessary risk for the facility to be permitted to have on site much more than a few hundred grams beyond that. Burnup would appear to be minimal. The rule of thumb is that 1 gram of fissionable material is burned up per MWD of heat produced; given a maximum power level of 100 kw_{th} and a restriction to 5% of the year operating factor, which I am told the reactor is restricted to, in 20 years a maximum of about 36 MWD of thermal energy could be produced. If this is so, a maximum of less than 40 grams of U-235 will be consumed through burn-up, a far cry from the thousands of grams requested in the license.

10. I understand that the Environmental Impact Appraisal for this reactor indicates that a total of about 700 grams of U-235 have been "used" in the past twenty years. If this is true, and assuming that part of that 700 grams constitutes damaged fuel as opposed to burnup, operating experience would indicate approximately 700 grams spare fuel would be sufficient, and even then, there is no reason of which I am aware that a full twenty years' supply needs to be on site all the time or at any one time. In my opinion, more than 4300-4500 grams U-235 permitted on site and granted through a license would be excessive, absent a substantial showing of need, and would pose an unnecessary threat to common defense and security through risk of diversion or theft.

11. I have reviewed a July 1982 calculation by Neill C. Ostrander of the Nuclear Energy Laboratory entitled "Fuel Self Protection Calculation." If he is correct that after seven days of shutdown the radiation dose at four feet from the core center without intervening shielding is 142 Rem/hour, then each individual fuel bundle (of which I understand there are twenty-four, each containing eleven fuel plates) would be about 10 Rem/hour at three feet (unshielded). Thus it would appear necessary to raise these radiation levels by more frequent (short-term) operation of the reactor to approach the 100 Rem/hour level for each fuel bundle and would appear prudent to do so if the radiation level of the fuel is being relied upon as a deterrent to theft.

12. My conclusions are that the Applicant, in order to obtain a license, should: (a) reduce the total amount of U-235 permitted on site to about 4 kg, (b) lower the enrichment of U-235 significantly unless the Applicant can clear demonstrate that this is infeasible, and (c) institute an operation schedule which would raise the radiation level of the fuel bundles. In addition, the security measures taken to protect what material is permitted on site need to be substantial, particularly if the above measures are not taken. 9700 grams of 93% enriched uranium are by no means <u>de minimus</u>; nor for that matter are 4900 grams. Theft or diversion of such material could have grave effects for our common defense and security, as well as public health and safety.

13. The above suggestions would be consistent with U.S. policy and prudent in terms of protecting against the very worrisome prospect of an unnecessarily large quantity and unnecessarily high enrichment of uranium without adequate safeguards being stolen or diverted for use in a clandestine fission explosive. Furthermore, however, failure to take the above precautions, without substantial showing of good cause not to, would damage U.S. foreign policy interests by undercutting our government's attempts to reduce international commerce in HEU and convince other nations of the need to reduce their HEU holdings and the enrichment of their research reactor fuels. I know from personal experience in representing the State Department in such interactions with Chilean nuclear officials and representatives of Atomic Energy Commissions of other nations that it will be much more difficult for the U.S. to succeed in its policy of reduced enrichments and HEU holdings abroad if the policy is not vigorously pursued at home. The inconsistency of the US, on the one hand, denying HEU to foreign research reactors while, at the same time, oversupplying research reactors at home with HEU that is not properly safeguarded, would not be lost on the nations we are trying to influence.

14. Lastly, it should be stated that it is both national and international policy that kilogram quantities of HEU must be safeguarded. While timely warning, after the fact, of theft or diversion is a key element in such safeguards, post-loss reporting is not sufficient protection and, in my opinion, fails to meet the standard of taking measures to minimize the possibilities for unauthorized removal of such material consistent with the consequences of such removal. The removal of 9400 grams of 93% enriched U-235 would have extraordinarily serious potential consequences; the removal of 4900 grams of such material would have potential consequences many, many times greater than removal of 1000 grams of 20% enriched uranium. But even 1000 grams of such material, given the world situation with regards pressures for nuclear weapons proliferation, is not de minimus.

I, David W. Hafemeister, swear under penalty of perjury under the laws of the U.S. that the foregoing is true and correct to the best of my knowledge and belief.

Executed on August 25, 1982,
at Santa Cruz, California

David W. Hafemeister
David W. Hafemeister, Ph.D.

David W. Hafemeister
Professor of Physics
California State Polytechnic University

Professional Qualifications

1. Education:

   a. Bachelor of Science degree in Mechanical Engineering from Northwestern University, 1957
   b. MS. and Ph.D. in Physics, University of Illinois, 1959, 1964
   c. Post-Doctoral Fellowships:
      Los Alamos Scientific Laboratory (1964-66)
      American Association for the Advancement of Science
      Congressional Fellowship (1975-1976)

2. Employment

   a. Mechanical Engineer, Argonne National Lab (1957-58)
   b. Physicist, Los Alamos Scientific Laboratory (1964-66)
   c. Assistant Professor of Physics, Carnegie-Mellow University (1966-69)
   d. Associate Professor of Physics (1969-72)
      Professor of Physics (1972-)
      California Polytechnic University, San Luis Obispo, CA
   e. Visiting Professor of Physics
      University of Groningen, The Netherlands (1972, 1980)
   f. Legislative Assistant and Science Advisor to Senator John Glenn
      U.S. Senate (1975-77)
   g. Special Assistant to Under Secretary of State Lucy Benson and Deputy-Under Secretary Joseph Nye, U.S. Department of State (1977-1979)

3. Experience with Nuclear Non-Proliferation Matters

   a. U.S. Senate: After the detonation by India of a nuclear device in 1974, the Committee on Governmental Affairs of the U.S. Senate held extensive hearings on the "Export Reorganization Act of 1975" which dealt with nuclear nonproliferation. It was my job to be the full-time staffperson to the Ad-hoc Chairman of the Committee, Senator Glenn, on hearings and mark-up of the act. I was Senator Glenn's main advisor on nuclear non-proliferation matters.

   b. Department of State: In 1977, I was appointed as one of two Special Assistant on the issue of nuclear nonproliferation to Under Secretary Benson and Deputy-Under Secretary Nye. Dr. Nye had the lead role for nuclear non-proliferation in the Executive Branch and at the London Nuclear Supplier Negotiations.

      During this time, I was intimately involved with the drafting and passage of the Nuclear Non-Proliferation Act of 1978, participating in the Department of Energy's Non-proliferation Alternative Systems Assessment Program (NASAP), and dealing as a representative of the Under Secretary with officials of other nations' nuclear programs.

In addition, I was the lead State Department delegate to Working Group 8 (Advanced Fuel Cycle and Reactor Concepts) of the International Fuel Cycle Evaluation (INFCE) which was held at the International Atomic Energy Agency (IAEA) in Vienna. Subgroup C of this Working Group had as its sole task the assessment of methods of reducing proliferation risks associated with research reactors.

4. Publications

a. Nuclear Non-Proliferation:

i. "Nonproliferation and Alternative Nuclear Technologies", Technology Review 81, 58 (December 1978).

ii. "Science and Society Test V: Nuclear Nonproliferation", American Journal of Physics 48, 112 (1980)

iii. prime author/editor of the Presidential Report to the Congress on the environmental impacts associated with nuclear exports abroad (1980)

iv. co-author/editor of the Supplement Nuclear Research and Development Export Activities to ERDA 1542 (U.S. Nuclear Export Activities), September 1979.

b. Solid State and Nuclear Physics:

20 articles; four book chapters; one book

c. Energy Technology and Policy:

10 articles

JAN 12 1981

Dr. Walter F. Wegst
University of California
at Los Angeles
Director of Research and
Occupational Safety
Office of Environmental
Health and Safety
Los Angeles, California 90024

Dear Dr. Wegst:

Following a site visit and review of your Physical Security Plan by NRC, we have determined that the UCLA reactor operating and SNM storage sites are contiguous. As such the facility must implement interim Category I physical security requirements. These requirements are currently contained in 10 CFR Parts 73.67(a)(b)(c)(d) and 73.60.

In order to be exempt from the above requirements, the fuel in storage would have to be shipped to another location or the reactor would have to be operated to maintain the fuel irradiation level at a dose rate [illegible] 100 rem/hr at 3 feet from any accessible surface. (See 10 CFR 73.6(b) and 73.67(b)(1)(i)).

By January 31, 1981, please indicate your confirmation of the above and your plan for compliance with this temporary adjustment.

Sincerely,

ORIGINAL SIGNED BY
JAMES R. MILLER

ORIGINAL SIGNED BY
JAMES R. MILLER

James R. Miller, Chief
Standardization & Special
Projects Branch
Division of Licensing

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EXHIBIT M

OFFICE	DL:SSPB	DL:SSPB	DL:SSPB	DL:AD/L	DS:SGPB		
SURNAME	LTremper	HBernard/cc	JMiller	RTedesco	D. Carlson		
DATE	12/24/80	12/29/80	12/29/80	12/30/80	1/7/81		

NRC FORM 318 (10-80) NRCM 0240

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USGPO 1980—

ITY OF CALIFORNIA, LOS ANGELES UCLA

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COMMUNITY SAFETY DEPARTMENT
OFFICE OF RESEARCH & OCCUPATIONAL SAFETY
LOS ANGELES, CALIFORNIA 90024

January 29, 1981

James R. Miller, Chief
Standardization and Special Projects Branch
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miller:

In reference to your letter of January 12, 1981: We are scheduling reactor operations to conform with the self-protection criteria for the in-core fuel. As this represents a temporary arrangement, we are proceeding to identify viable options for the reduction of our unirradiated SNM inventory.

Two options have been identified; (1) transfer to the DOE Lawrence Livermore National Laboratory (LLNL), and (2) return to DOE, Idaho Falls. The DOE and LLNL have tentatively indicated the acceptability of either destination, subject to approval of final plans.

Very truly yours,

Walter F. Wegst, Director
Research & Occupational
Safety

WFW/NCO/lc

A020 S/10

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EXHIBIT N

October 28, 1974

Karl R. Goller
Assistant Director for
Operating Reactors
Directorate of Licensing
USAEC
Washington, D. C. 90545

Dear Sir:

Due to the sensitive nature of the contents of this letter, we request that this document be withheld from public disclosure pursuant to Section 2.790 of 10 CFR Part 2.

Upon redoing our calculations on the Special Nuclear Material inventory, we found that our scrap quoted to you was the total uranium content, not the U-235 content. Therefore, we have at our facility a total SNM inventory of 9.387 kg. Of this, 4.293 kg. are exempt and 5.094 kg. are non-exempt.

In order to comply with the 5 kg. limit and approval of our security system, we request permission to ship 340 grams of U-235 to Oak Ridge - Y-12 facility. This would bring our non-exempt SNM inventory down to 4.754 kg. and our total SNM inventory down to 9.047 kg.

Forms OR-658C and Forms OR-658A have been sent to:
Joe Mahler
Product Division
USAEC
Oak Ridge Operations Office
P. O. Box "E"
Oak Ridge, Tennessee 37831

Sincerely,

Charles E. Ashbaugh III
Reactor Supervisor

EXHIBIT O

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

Docket No. 50-142

NOV 18 1974

The Regents of the University
of California
Nuclear Energy Laboratory
ATTN: Mr. Thomas E. Hicks
Director
Los Angles, California

Gentlemen:

Your letter of October 28, 1974 stated that UCLA was considering methods to reduce their Special Nuclear Material inventory below the formula quantity specified in Title 10, Code of Federal Regulations, Part 73.

As of this date we have not received a written confirmation that you have reduced your Special Nuclear Material inventory nor have we received a request to review your security plan assuming the inventory was reduced. You are reminded that your original plan, as submitted, was not acceptable and that you may be in violation of Title 10, Code of Federal Regulations, Part 73. Noncompliance with the Regulations would require that appropriate enforcement action be taken by us.

Your response is requested within seven days of the receipt of this letter.

Sincerely,

for George Lear, Chief
Operating Reactors Branch #3
Directorate of Licensing

EXHIBIT P

November 27, 1974

Karl R. Goller
Assistant Director for
Operating Reactors
Directorate of Licensing
USAEC
Washington, D. C. 90545

Dear Sir:

Due to the sensitive nature of the contents of this letter, we request that this document be withheld from public disclosure pursuant to Section 2.790 of 10 CFR Part 2.

In order to comply with the 5 Kg. limit and approval of our security system, we have finally contacted someone who would ship our 340 grams U-235 from UCLA to Oak Ridge-Y-12 facility.

The receiver is:
Union Carbide Corp. Nuclear Division
Y-12 Plant Post Office Box Y
Oak Ridge, Tennessee 37830
Attn: M.C. Bays/E.R. Pulley
For Recovery

The shipping company is:
Consolidated Freightways
12903 Lakeland Rd.
Santa Fe Springs, Calif. 90670

Due to their company policy and DOT regulations, they will try to pick it up today, or else sometime during the first week in December. Their policy and DOT regulations state that if our package is sent by truck there must be no food or clothing along with the shipment. That is the reason for the time delay.

When the fissile material is finally off campus and all required forms have already been filled, our total non-exempt SNM inventory will be 4.754 Kg. We request verification and approval of our security system.

Sincerely,

Charles E. Ashbaugh III
Reactor Supervisor

CEA:vl

EXHIBIT Q

December 12, 1974

Mr. M. C. Bays
Mr. E. R. Pulley
Union Carbide Corporation
Nuclear Division
Y-12 Plant
Post Office Box Y
Oak Ridge, Tennessee 37830

Dear Sirs:

340 gms. of U^{235} was sent to you from the University of California Nuclear Energy Laboratory 2567 Boelter Hall Los Angeles, California 90024 on December 11, 1974 via Consolidated Freightlines, package No. 12345. You should receive it soon.

Sincerely,

Charles E. Ashbaugh III
Reactor Supervisor
Nuclear Energy Lab

EXHIBIT R

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE
LOS ANGELES, CALIFORNIA 90024

Boelter Hall 2567
November 9, 1978

Mr. George L. Rogosa, Director
Division of Nuclear Physics
Office of High Energy and Nuclear Physics
Department of Energy
Washington, D.C. 20545

Reactor Fuel Cycle Assistance
DOE: EY-76-S-0034
Project Agreement 192

Dear Mr. Rogosa:

I have received your letter of October 31, 1978 regarding the return of irradiated fuel elements to the U.S. Government. The return will reduce our fuel inventory to a level commensurate with our security provisions and will eliminate an "unresolved item" noted by a Nuclear Regulatory Commission inspector during a recent routine security inspection.

An estimate of the minimum cost of return is shown in Attachment 1. Penalties due to delays beyond the control of UCLA could increase the cost to something over $4000.

Our request for DOE funding of the return is based upon our Reactor Fuel Cycle Assistance contract. That agreement stipulates under part A-II(b)(2); that, among items to be contributed by the government and, (iii) during the term of this Project Agreement 192, the Commission .... will:

(B) Reimburse the University for costs incurred in returning spent fuel elements for reprocessing, including rental of or fabrication charges for shipping containers as mutually agreed to by the parties.

The University supports the normal on-going cost of reactor operations. Because of Project Agreement 192, the University has never budgeted the cost of fuel return. Under the tight budgets to today, $4000 represents a major matter to the School and a serious matter to the Nuclear Energy Facility.

I believe the government should honor the commitment of PA 192 and the current Mod 7 supplement. I respectfully request DOE support of the cost of this fuel return.

Sincerely,

I. Catton, Director
Nuclear Energy Laboratory

H. Dhillon
Contract and Grant Officer

IC/NCO/li
cc: C. A. Berger, DOE/SAN
D. G. McIntosh, DOE/SAN
R. R. O'Neill, Dean, UCLA/SEAS

EXHIBIT S

UNIVERSITY OF CALIFORNIA, LOS ANGELES

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SCHOOL OF ENGINEERING AND APPLIED SCIENCE
LOS ANGELES, CALIFORNIA 90024

Boelter Hall 2567
March 1, 1979

Mr. C. A. Berger, Contracts Branch
U.S. Department of Energy
San Francisco Operations Office
1333 Broadway
Oakland, California 94612

Re: Contract EY-76-03-034, P.A. 192

Dear Mr. Berger:

By copy of our letter of November 9, 1978 to Dr. Rogosa; you were advised of our request to DOE for support of the cost of shipping some excess irradiated fuel to the Idaho Chemical Reprocessing Plant. The estimated cost of the operation is approximately $4000, and support was sought under the subject contract.

Mr. D. G. McIntosh (DOE/SAN) has been helpful in arranging for the physical transfer and shipment. These plans are going forward.

Paragraph 3 of our letter to Dr. Rogosa outlined the basis of our request. We have not yet received a response. We are presently in technical violation of our SNM possession limit, and further delay could invite a Notice of Violation by the Nuclear Regulatory Commission. Your immediate action is now requested. Please call us if you have any questions.

Sincerely,

Hardy Dhillon
Contract and Grant Officer
(213) 825-0695

Ivan Catton, Professor and Director
Nuclear Energy Laboratory
(213) 825-2040

IC/li

cc: D. G. McIntosh, DOE/SAN
✓G. L. Rogosa, DOE, Division of Nuclear Physics
R. R. O'Neill, Dean, UCLA/SEAS
C. E. Ashbaugh, UCLA/SEAS/NEL
R. H. Engelken, USNRC, Region V

EXHIBIT T

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of THE REGENTS OF THE UNIVERSITY OF CALIFORNIA (UCLA Research Reactor)	))))))	Docket No. 50-142 OL (Proposed Renewal of Facility License)

CERTIFICATE OF SERVICE

I hereby certify that copies of the attached: INTERVENOR BRIDGE THE GAP'S RESPONSE TO NRC STAFF'S MOTION FOR SUMMARY DISPOSITION AS TO THE ISSUE OF THE APPLICABILITY OF 10 CFR 73.60 AND THE NEED TO PROTECT AGAINST SABOTA E in the above-captioned proceeding ha e been served on the following by deposit in the United States mail, first clas., postage prepaid, addressed as indicated, on this date: SEPTEMBER 7, 1982.

John H. Frye, III,
Chairman
Atomic Safety & Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dr. Emmeth A. Luebke
Administrative Judge
Atomic Safety & Licensing Board
U.S. Nucle r Regulatory Commission
Washingto., D.C. 20555

Dr. Oscar H. Paris
Administrative Judge
Atomic Safety and Licensing Board
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Chief, Docketing and Service Section (3)
Office of the Secretary
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Counsel for NRC Staff
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555
attention: Ms. Colleen P. Woodhead

William H. Cormier
Office of Administrative Vice Chancellor
University of California
405 Hilgard Avenue
Los Angeles, California 90024

Christine Helwick
Glenn R. Woods
Office of General Counsel
590 University Hall
2200 University Avenue
Berkeley, CA 94720

Sarah Shirley
Deputy City Attorney
Office of the City Attorney
City Hall
1685 Main Street
Santa Monica, CA 90401

Committee to Bridge the Gap
1637 Butler Avenue, Suite 203
Los Angeles, California 90025

Daniel Hirsch
P.O. Box 1186
Ben Lomond, CA 95005

Dorothy Thompson
Nuclear Law Center
6300 Wilshire Blvd., Suite 1200
Los Angeles, CA 90048

John Bay
Counsel for Intervenor
COMMITTEE TO BRIDGE THE GAP