COMMITTEE TO BRIDGE THE GAP
1637 BUTLER AVENUE #203
LOS ANGELES, CALIFORNIA 90025
(213) 478-0829

DOCKETED
USNRC

'82 SEP 17 A10:58

September 14, 1982

In the Matter of
The Regents of the University of California
Docket 50-142 OL

MEMO TO BOARD AND PARTIES:

It has come to my attention that certain portions of CBG's Motion for Summary Disposition were incompletely or incorrectly duplicated.

Some copies apparently were missing one or both exhibit sheets, as well as Exhibit V to the Contention XIII Motion.

In addition, the particular copying machine employed appears to have turned the light yellow underscoring of emphasized passages into a black mark obliterating the intended sections.

Therefore, please find enclosed exhibit sheets for both Motions and Exhibit V for the Contention XIII Motion and Exhibit G and M for the Contention XVII Motion.

Also, please note that the first sentence on page 18 of the Contention XIII Motion should read: "Records provided by UCLA's Neill Ostrander, transmitted by cover letter of William Cormier on August 26, 1982 indicate only three shipments took place thereafter, of 730 grams, 600 grams, and 2360 grams, which would leave the University still with about 5350 grams."

Respectfully submitted,

Daniel Hirsch

Daniel Hirsch
President
COMMITTEE TO BRIDGE THE GAP

cc w/ enclosures: service list

DS03

Cont. XIII

EXHIBIT SHEET

EXHIBIT

A	Declaration of Dr. David W. Hafemeister*
B	Selection from Office of Technology Assessment's Nuclear Proliferation and Safeguards Report**
C	International Nuclear Fuel Cycle Evaluation, Report of INFCE Working Group 8, Advanced Fuel Cycle and Reactor Concepts**
D	Department of Energy Fiscal Year 1981 Budget: Nuclear Nonproliferation Programs, Hearing before Foreign Affairs Committee, U.S. House of Representatives, April 16, 1980**
E	Progress in U.S. and International Nonproliferation Efforts, Hearing before Foreign Affairs Committee, March 12, 1979**
F	U.S. DOE Second Annual Report on Nuclear Non-Proliferation, Supplement to Secretary's Annual Report to Congress, 1980**
G	First Annual Report on Nuclear Non-Proliferation, DOE/PE-0014/R1**
H	Nuclear Proliferation and Civilian Nuclear Power, Report of the Nonproliferation Alternative Systems Assessment Program, June 1980, DOE/NE-0001**
I	Use of High-Enriched Uranium (HEU) in Research Reactors; NRC Policy Statement, August 24, 1982, 47 FR 37007
J	Rulemaking Issue: Physical Security Requirements for Nonpower Reactor Licensees Possessing a Formula Quantity of SSNM, SECY-81-376
K	10/10/78 Letter, University of Florida to NRC, regarding use of 4.8% enriched UO_2 fuel in U of F Argonaut reactor
L	Section of UCLA Application for License Renewal, containing SNM license request and indication of Radium-startup source use
M	Argonaut Reactor Databook, Sturm and Daavettila, January 1961, ANL-6285
N	25 August 1982 Memorandum from Neill Ostrander re 1 gm/yr burnup & SNM inventories 1970 to date
O	10/28/74 letter Ashbaugh to Goller, indicating 9.047 kg U-235 as of 12-21-74, as opposed to 8.62 indicated in Ostrander Memorandum, a discrepancy of nearly half a kilogram
P	University of Florida Hazards Analysis, indicating 20% fuel use
Q	Summary Report on the Hazards of the Argonaut Reactor by Lennox and Kelber, ANL-5647, December 1956
R	Directory of Nuclear Reactors, Volume V, International Atomic Energy Agency
S	AEC Hazards Analysis of Amendment 2 to UCLA license, regarding replacement of Pu-Be source with Ra-Be source
	Original License showing 3.34 kg use, with 10 grams suppleenting original shipment every 4-5 years
	Original Application
T	16 pages of SNM license correspondence
U	IAEA-TECDOC-233, Research Reactor Core Conversion from the Use of Highly Enriched Uranium to the Use of Low Enriched Uranium Fuels Guidebook, International Atomic Energy Agency, 1980
V	WASH 1192, Operational Accidents and Radiation Exposure Experience Within the Atomic Energy Commission, issued fall 1971

* as per 28 U.S.C. §1746, declaration format is employed

** as cited in Hafemeister declaration

Note: emphasis added by CBG

Cont. XVII

EXHIBIT SHEET

Exhibit

A	Declaration of Dr. Sheldon C. Plotkin
B	Photographs taken by Dr. Plotkin
C	FEMA Report selections
D	Estimates of the Risks Associated with Dam Failure 6/ selections
E	Photos of 1971 Olive View Hospital Quake Damage and related items from Second Report of the Governor's Earthquake Council
F	Abstract from California Division of Mines and Geology Special Report 114 "A Review of the Geology and Earthquake History of the Newport-Inglewood Structural Zone, Southern California", 1974
G	portion of NUREG/CR-2198
H	1958 Uniform Building Code
I	1979 Uniform Building Code
J	portions of CBG's July 31, 1981 Interrogatories to NRC Staff as to the SER
K	portions of Staff's responses to said Interrogatories
L	portions of CBG's 4/20/81 Interrogatories to Applicant
M	portions of Applicant's 5/20/81 responses to said Interrogatories 7/
N	portions of Preliminary Geologic Environmental Map of the Greater Los Angeles Area, California (A Study Pertinent to Nuclear Facility Siting and Design) prepared by National Center for Earthquake Research, USGS, prepared on behalf of USAEC, 1970 8/
O	Map of the Newport-Inglewood Structural Zone and Other Structural Features of the Los Angeles Area, Southern California, by California Division of Mines and Geology, 1974 9/
P	Map of Beverly Hills Quadrangle Special Studies Zone by California Division of Mines and Geology 10/

6/ prepared under AEC contract by UCLA School of Engineering; two of the authors were Thomas Hicks, the late Director of NEL, and David Okrent, formerly on Radiation Use Committee, currently on Radiation Safety Committee, at UCLA.

7/ emphasis has been added by underlining key admissions

8/ reactor site location has been added by an "+" mark

9/ reactor site location has been added by an "+" mark

10/ the map only shows the faults within the special studies zone, marked by straight-line segments connecting encircled turning points; in this case, all that is shown is one trace of the Newport-Inglewood Fault, indicating its proximity to UCLA and possible even closer proximity due to uncertainties about its endpoint.

Exhibit V

WASH 1192
UC-41

OPERATIONAL ACCIDENTS and RADIATION EXPOSURE EXPERIENCE

Within the

UNITED STATES ATOMIC ENERGY COMMISSION

DIVISION OF OPERATIONAL SAFETY
WASHINGTON, D. C. 20545

ISSUED FALL 1971

For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C., 20402 - Price $1.25

Section 2

CRITICALITY ACCIDENTS

In the AEC's operational activities (not licensed) for the past 28 years there have been a total of 26 occasions (see Chart XV) when the power level of fissile systems became uncontrollable because of unplanned or unexpected changes in the system reactivity. On three occasions, the power excursions were planned; however, the fission energy released during the excursion was significantly larger than was expected. There have been a total of six deaths attributable to criticality accidents. The property damage resulting from these excursions has been approximately $4,455,000; however, 98% of the property loss was due to the SL–1 reactor excursion.

Further study of this accident record reveals that nine of the unplanned excursions occurred behind heavy shielding and three of them occurred in facilities remotely located with respect to personnel. Hence, the probability of injuries to people was reduced almost to the vanishing point. It is also noted that fourteen of the accidents occurred during experiments, six occurred in production or processing facilities, and five in reactor activities. In these laboratory, production, and reactor facilities there were, respectively, two, one, and three fatalities.

A review of these incidents has been made by W. R. Stratton, University of California, Los Alamos Scientific Laboratory, Los Alamos, N. Mex. All we have done below is to prepare a brief description of each incident.

CHART XV

CRITICALITY ACCIDENTS IN USAEC FACILITIES*

Date	Location	Active Material	Geometry	Total Fissions	Cause	Physical Damage	$ Loss
			METAL SYSTEMS IN AIR				
Aug. 21, 1945	Los Alamos, New Mexico	6.2 Kg δ-phase Pu	Spherical core tungsten-carbide reflected	$\sim 10^{16}$	Hand stacking reflector	None	–
May 21, 1946	Los Alamos, New Mexico	6.2 Kg δ-phase Pu	Spherical core Be reflected	$\sim 3 \times 10^{15}$	Hand stacking reflector	None	–
Apr. 18, 1952	The Los Alamos Scientific Lab., New mexico	92.4 Kg uranium metal, 93% U-235	Cylinder unreflected	1.5×10^{16}	Computation error	None	–
Feb. 3, 1954	The Los Alamos Scientific Lab., New Mexico	53 Kg uranium metal, 93% U-235	Sphere unreflected	5.6×10^{16}	Incorrect operation	Slight warping of pieces	$800
Feb. 12, 1957	The Los Alamos Scientific Lab., New Mexico (GODIVA)	54 Kg uranium metal, 93% U-235	Sphere unreflected except for experiment	1.2×10^{17}	Shift of experiment	Warping, oxidation near melting close to center	$2,400
Nov. 10, 1961	The Oak Ridge National Lab., Tennessee	76 Kg uranium metal, 93% U-235		$\sim 10^{16}$	Too rapid assembly	None	–
Mar. 26, 1963	LRL Livermore Calif.	47 Kg 93% U-235	Cylinder reflected	3×10^{17}	Too rapid assembly	Assembly machine and fire effects	$94,861
			SOLUTION SYSTEMS				
Dec., 1949	The Los Alamos Scientific Lab., New Merico	~1 Kg U-235 $UO_2(NO_3)_2$ in 13.6 liters water	Sphere graphite reflected	$3\text{–}4 \times 10^{16}$	Manual withdrawal of two poison control rods	None	–
Nov. 16, 1951	The Hanford Works, Richland, Washington	1.15 Kg Pu $PuO_2(NO_3)_2$ in 63.8 liters water	Sphere 83% full unreflected	8×10^{16}	Poison control rod run out too fast	None	–
May 26, 1954	The Oak Ridge National Lab., Tennessee	18.3 Kg U-235 UO_2F_2 in 55.4 liters water	Cylindrical annulus unreflected	1×10^{17}	Tilting of inner poison cylinder	None	—
Feb. 1, 1956	The Oak Ridge National Lab., Tennessee	27.7 Kg U-235 UO_2F_2 in 58.9 liters water	Cylinder unreflected	1.6×10^{17}	Falling scram set up waves creating a critical geometry	Warping of bottom of cylinder	—
June 16, 1958	Y-12 Processing Plant, Oak Ridge, Tennessee	2.5 Kg U-235 $UO_2(NO_3)_2$ in 56 liters water	Cylinder concrete reflected below	1.3×10^{18}	Wash water added to $UO_2(NO_3)_2$ solution	None	$1,000
Dec. 30, 1958	The Los Alamos Scientific Lab. New Mexico Pu Processing Plant	3.27 Kg Pu $PuO_2(NO_3)_2$ in ~160 liters water	Cylinder water reflected below	1.5×10^{17}	Agitator created a critical geometry	None	—
Oct. 16, 1959	Chemical Processing Plant, Idaho Reactor Testing Area	34.5 Kg U-235 ~800 liters $UO_2(NO_3)_2$ water	Cylinder concrete reflected below	$\sim 4 \times 10^{19}$	Solution surged from safe to unsafe geometry	None	$61,500 (to recover contam. solution)
Jan. 25, 1961	Chemical Processing Plant, Idaho Reactor Testing Area	8 Kg U-235 $UO_2(NO_3)_2$ in 40 liters water	Cylinder	6×10^{17}	Solution pumped from safe to unsafe geometry	None	$8,000
Apr. 7, 1962	Hanford Atomic Products	Pu Solution	Cylinder	8×10^{17}	Solution over flow down unsafe geometry transfer tank		$1000
Jan. 30, 1963	Y-12 Processing Plant, Oak Ridge, Tennessee	2.3 Kg U-235 $UO_2(NO_3)_2$ in 20 liters water	Sphere water reflected	1.1×10^{16}	Solution surged from safe to unsafe geometry	None	—
			INHOMOGENEOUS WATER MODERATED SYSTEMS				
June 4, 1945	Los Alamos, New Mexico	35.4 Kg uranium ~48% U-235 1/2-in. cubes	Pseudosphere water reflected	$\sim 3 \times 10^{16}$	Water seeping between blocks	None	—
Mar. 20, 1961	The Los Alamos Scientific Lab., New Mexico	2 cylinders uranium 24.4 and 38.5 Kg 93% U-235	2 cylinders water reflected	10^{17}	Scram increased reactivity	Slight oxidation	—
June 2, 1952	The Argonne National Lab.	6.8 Kg U-235 oxide particles in plastic	Inhomogeneous cylinder water reflected	1.22×10^{17}	Manual withdrawal of central safety rod	Plastic destroyed	—
July 22, 1954	The Reactor Testing Area, Idaho Falls, Idaho (BORAX)	U-Al plates clad with Al	Inhomogeneous cylinder water moderated	4.68×10^{18}	Estimate of expected excursion too low	Reactor destroyed intentionally by test	—
Jan. 3, 1961	Idaho Reactor Testing Area (SL-1)	U-Al plates clad with Al	Inhomogeneous cylinder water moderated	1.5×10^{18}	Under study	Extensive to reactor	$4,350,000
			MISCELLANEOUS SYSTEMS				
Feb. 11, 1945	Los Alamos, New Mexico	UH pressed in styrex	Cylinder	$\sim 6 \times 10^{15}$	Reflector added and/or source too large	UH-styrex cubes swollen and blistered	—
Nov. 29, 1955	Idaho Reactor Testing Area (EBR-1)	1/2-in. U-235 rods	Cylinder, rods cooled by NaK	4.7×10^{17}	Incorrect scram used	Core molten	Not reported
July 3, 1956	The Los Alamos Scientific Lab., New Mexico	58 Kg uranium 93% U-235, 2 and 5 mil foils	Cylinder	3.2×10^{16}	Too rapid assembly	None	—
May 16, 1967	Los Alamos, New Mexico	U-235 in graphite	Cylindrical	4×10^{16}	Improper procedure	None	—

*For additional information on these accidents, see previous TID-5360 series and "A Review of Criticality Accidents" by W. R. Stratton, University of California (LASL).

CRITICALITY EXCURSION INCIDENT

Oak Ridge, Tenn., Jan. 30, 1968

Unexpected criticality was achieved in a volume of an aqueous solution of a salt of U^{235} during a series of routine critical experiments in progress in a well-shielded assembly area of a critical experiments facility. The criticality-radiation alarm system functioned as designed, the evacuation of personnel from the building was prompt and orderly, and the excursion was terminated expeditiously by a negative coefficient of reactivity and was prevented from recurring by the action of the safety devices. The fission yield was 1.1×10^{16}. Gamma-ray sensitive personnel dosimeters read immediately following the excursion showed no direct exposure greater than 5 mr to any person present. There was no property damage or loss of fissile materials. An estimated 100 cm^3 of solution (15 g of U) were spilled when a rubber-stoppered connection immediately above the sphere was dislocated.

The purpose of the particular experiment in progress was to establish the critical concentration of a sphere of the solution of uranyl nitrate surrounded by a thick water reflector. In the course of approaching criticality by incremental additions of solution, a small volume of air was observed entrapped in a flexible transparent tube. Supercriticality occurred during an attempt, by remote manipulation of liquid levels, to remove the air.

ACCIDENTAL CRITICALITY EXCURSION

Los Alamos, N. Mex., May 18, 1967

A nuclear excursion of 4×10^{16} fissions took place in the critical mockup of a high power density reactor. There was neither damage to the equipment nor significant exposure to persons; nevertheless, the incident indicated poor practice and an undesirable interpretation of operating procedures which has been corrected. The reactor mockup is fueled with elements composed of fully enriched uranium in a graphite matrix, and a smaller number of graphite moderating elements. This permits a relatively small core volume (250 liters). The core, housed in a graphite cylinder, drops out of its Be reflector for loading. Control and safety drums are within the annular reflector.

Before the incident, fuel along the core axis was replaced by additional moderating elements to investigate flux-trap effects. Instead of the usual step-wise interchange of elements, the entire moderating island was installed. Then, instead of step-wise multiplication measurements while inserting the core into the reflector, which is proper for initial approaches to criticality, there were no measurements during interrupted insertion. It had been inferred from the behavior of different moderating elements in an earlier mockup that the overall reactivity change would be minor. This was a serious mistake, for the actual change proved to be about $10. Before complete closure was achieved, a very short period and scram (dropping the core and actuating the safety drums) occurred.

NUCLEAR EXCURSION AND FIRE

Livermore, Calif., Mar. 26, 1963

A nuclear excursion and subsequent fire took place during a subcritical experiment in a shielded vault designed for critical assembly experiments. The excursion was estimated at 4×10^{17} fissions and was followed by oxidation of the enriched uranium metal in the assembly.

The cause of the excursion is believed to have been directly attributable to mechanical failure.

The total property loss was $94,881.

NUCLEAR EXCURSION

Richland, Wash., Apr. 7, 1962

An unplanned nuclear excursion occurred in a plutonium processing facility because of the inadvertent accumulation of approximately 1500 grams of plutonium in 45–50 liters of dilute nitric acid solution in a 69-liter glass transfer tank. The sequence of events which led to the accumulation of the plutonium in the tank cannot be stated positively. However, it is believed that, when a tank valve was opened, the solution from another process vessel overflowed to a sump and was drawn into the transfer tank through a temporary line between this tank and the sump.

When the excursion occurred, radiation and evacuation alarms sounded. All but three employees left the building immediately, according to well-prepared and -rehearsed evacuation plans. Fortunately, they were not in close proximity to the involved system nor in a high radiation field.

The course of the nuclear reaction involved initial criticality (10^{16} fissions); a subsidence; one or more later peaks; and after approximately one-half hour, a declining rate of fission, which terminated in a subcritical condition 37 hours later. The total number of fissions was approximately 8×10^{17}.

Of the 22 persons in the building at the time, only four employees, those who were in the room with the system, were hospitalized for observation. Three of them were the system operators, who were in close proximity to the excursion, and who received estimated radiation doses of 110, 43, and 19 rem. None of them showed symptoms definitely referable to their radiation exposures. The fourth was sent to the hospital only because he was in the room at the time of the incident.

Some fission product activity, airborne via the vent system and the exhaust stack, was detected in the atmosphere for a brief period after the accident. The physical damage amounted to less than $1,000. (*See* TID-5360, Suppl. 4, page 17.)

NUCLEAR EXCURSION
Oak Ridge, Tenn., Nov. 10, 1961

A criticality excursion occurred as enriched uranium metal, neutron-reflected and -moderated by hydrogen, was being assembled. The excursion was caused by a too rapid approach of the two pieces of metal used in the experiment.

There was no personnel exposure or property damage. The energy release was estimated to be between 10^{15} and 10^{16} fissions. Fission product contamination, both airborne and contained in the metal, decayed sufficiently overnight to allow unhindered continuation of the experiment.

The incident occurred in a critical experiment laboratory specifically designed to accommodate such occurrences, since events of this nature cannot be considered entirely unexpected in an experimental facility of this sort. (*See* TID-5360, Suppl. 4, p. 14.)

CRITICALITY ACCIDENT
Idaho Falls, Idaho, Jan. 25, 1961

A nuclear excursion of approximately 6×10^{17} fissions occurred in a first-cycle product evaporator at a chemical processing plant. The criticality accident resulted when a solution of enriched uranyl nitrate accidentally surged from a geometrically safe section of the evaporator into the upper critically unsafe vapor disengagement section. The accident occurred behind thick concrete walls in a processing cell which is part of the first cycle for processing highly radioactive spent-fuel elements.

Personnel response to the radiation alarms and the evacuation signal was prompt and orderly.

Analyses of badges from 65 individuals indicated a maximum exposure of 55 millirem gamma and 0 beta. The maximum thermal neutron exposure detected in the badges analyzed was less than 10 millirem. Analyses of nuclear accident dosimeters indicated that there was negligible fast neutron flux associated with personnel exposures.

The radioactivity released to the atmosphere as a result of the accident was about twice normal background when it left the area. Loss of $6,000 resulted from cleanup of the incident. (*See* TID-5360, Suppl. 4, p. 9; 1961 *Nuclear Safety*, Vol. 3, #2, p. 71.)

SL-1 EXCURSION
Idaho Falls, Idaho, Jan. 3, 1961

A nuclear excursion occurred within the reactor vessel, resulting in extensive damage of the reactor core and room and in high radiation levels (approximately 500–1,000 rem/hr) within the reactor room.

At the time of the accident, a three-man crew was on the top of the reactor assembling the control rod drive mechanisms and housing. The nuclear excursion, which resulted in an explosion, was caused by manual withdrawal, by one or more of the maintenance crew, of the central control rod blade from the core considerably beyond the limit specified in the maintenance procedures.

Two members of the crew were killed instantly by the force of the explosion, and the third man died within two hours following the incident as a result of an injury to the head. Of the several hundred people engaged in recovery operations, 22 persons received radiation exposures in the range of three to 27 rem gamma radiation total-body exposure. The maximum whole-body beta radiation was 120 rem.

Some gaseous fission products, including radioactive iodine, escaped to the atmosphere outside the building and were carried downwind in a narrow plume. Particulate fission material was largely confined to the reactor building, with slight radioactivity in the immediate vicinity of the building.

The total property loss was $4,350,000. (*See* TID-5360, Suppl. 4, p. 8; 1962 *Nuclear Safety*, Vol. 3, #3, p. 64.)

CRITICALITY INCIDENT
Idaho Falls, Idaho, Oct. 16, 1959

A nuclear incident occurred in a process equipment waste collection tank when an accidental transfer was made of about 200 liters of uranyl nitrate solution, containing about 34 kilograms of enriched uranium (91 percent U^{235}), from critically safe process storage tanks to a geometrically unsafe tank through a line formerly used for waste transfers.

Limited visual inspections and test indicated that no significant property damage or loss resulted beyond the approximately $60,000 cost to recover contaminated uranium solution resulting from the incident.

Of the 21 personnel directly involved in this incident, seven received external exposures to radiation. The exposures were 8, 6, 3.95, 1.50, 1.38, 1.17, and 1.17 rem. Two individuals also received external exposures to the skin of 50 rem and 32 rem. No medical treatment was required for the 21 personnel involved. (*See* TID-5360, Suppl. 3, p. 14; *USAEC Serious Accidents* Issue #163, 4-18-60.)

FATAL INJURY ACCOMPANIES CRITICALITY ACCIDENT
Los Alamos, N. Mex., Dec. 30, 1958

The chemical operator introduced what was believed to be a dilute plutonium solution from one tank into another known to contain more plutonium in emulsion. Solids containing plutonium were probably washed from the bottom of the first tank with nitric acid and the resultant mixture of nitric acid and plutonium-bearing solids was added to the tank containing the emulsion. A criticality excursion occurred immediately after starting the motor to a propeller type stirrer at the bottom of the second tank.

The operator fell from the low stepladder on which he was standing and stumbled out of the door into the snow. A second chemical operator in an adjoining room had seen a flash, which probably resulted from a short circuit when the motor to the stirrer started, and went to the man's assistance. The accident victim mumbled he felt as though he was burning up. Because of this, it was assumed that there had been a chemical accident with a probable acid or plutonium exposure. There was no realization that a criticality accident had occurred for a number of minutes. The quantity of plutonium which actually was present in the tank was about ten times more than was supposed to be there at any time during the procedure.

The employee died 35 hours later from the effects of a radiation exposure with the whole-body dose calculated to be 12,000 rem ±.

Two other employees received radiation exposure of 134 and 53 rem, respectively. Property damage was negligible. (*See* TID-5360, Suppl. 2, p. 30; *USAEC Serious Accidents* Issue #143, 1-22-59.)

NUCLEAR EXCURSION
Oak Ridge, Tenn., June 16, 1958

A nuclear accident occurred in a 55-gallon stainless steel drum in a processing area in which enriched uranium is recovered from various materials by chemical methods in a complex of equipment. This recovery process was being remodeled at the time of the accident.

The incident occurred while they were draining material thought to be water from safe 5-inch storage pipes into an unsafe drum.

Eight employees were in the vicinity of the drum carrying out routine plant operations and maintenance. A chemical operator was participating in the leak testing which inadvertently set off the reaction. He was within three to six feet of the drum, while the other seven employees were from 15 to 50 feet away.

Using special post hoc methods for determining the neutron and gamma exposures of the employees involved, it was estimated that the eight men received: 461 rem, 428 rem, 413 rem, 341 rem, 298 rem, 86 rem, 86 rem, and 29 rem.

Area contamination was slight, with decontamination costs amounting to less than $1,000.

During this incident 1.3×10^{18} fissions occurred. (*See* TID-5360, Suppl. 2, p. 25; *USAES Serious Accidents* Issue #136, 8-25-59; *USAEC Health and Safety Information* Issue #82, 9-5-58; 1959 *Nuclear Safety*, Vol. 1, #2, p. 59.

GODIVA EXCURSION

Los Alamos, N. Mex., Feb. 12, 1957

The "Godiva" assembly was to be used to irradiate uranium-loaded graphite samples. The samples were to be heated in a shielded furnace, exposed to a "prompt" burst of neutrons and then transferred to a counter for evaluation. The experiments are conducted at an isolated site in a building separated from the control room and all personnel by about a quarter of a mile.

On the occasion of the accident, preliminary bursts were being produced. In the process of lowering the top safety block, an unexpected burst occurred that was estimated to have produced 1.2×10^{17} fissions. The energy was great enough to tear the uranium parts from the assembly, knocking one to the floor, and to distort the steel rods in the frame. The uranium was deformed and there was much more surface oxidation than usual.

There were no personal injuries or overexposures. No gamma radiation above background was detected outside the reactor building. Radiation levels in the building were high initially . . . seven roentgens per hour gamma just inside the door (12′ from Godiva) and 5,000 to 20,000 counts per minute (per 55 cm² probe) alpha on horizontal surfaces about the room; therefore cleanup procedures were delayed 2½ days until they could be completed without unnecessary exposure to cleanup personnel.

The total property loss was estimated at $2,400. (*See* TID-5360, Suppl. 2, p. 18; *USAEC Health and Safety Information* Issue #75, 1-8-58.)

HONEYCOMB EXCURSION

Los Alamos, N. Mex., July 3, 1956

Too rapid assembly caused the system to become promptly critical. The burst yield was 3.2×10^{16} fissions.

There were no radiation exposures nor any property damage as a result of the incident.

EXPERIMENTAL REACTOR

Oak Ridge, Tenn., Feb. 1, 1956

A homogenous UO_2F_2 water-moderated critical assembly was made prompt critical by an overaddition of fuel to the assembly. Before reaching the critical point, the hand-operated valve was turned off. However, fuel continued to be added to the reactor because of air pressure in the line. Although the automatic safety system operated, assuring termination of the burst, considerable fuel was displaced from the reactor. The number of fissions in the burst was estimated to be about 1.6×10^{17}.

No serious exposures resulted, since all personnel were shielded by a minimum of five feet of concrete. There was no significant property damage and all uranium was recovered. (*See* TID-5360, Suppl. 1, p. 5.)

CORE MELTDOWN

Idaho Falls, Idaho, Nov. 29, 1955

The Experimental Breeder Reactor (EBR-I) was undergoing a series of experiments.

Without modification, certain safety instrumentation would not permit the conduct of the experiment; therefore, reliance was placed on manual control to shut down the reactor.

During an experiment, the scientist in charge told the operator to press the "emergency reactor off" button. This would have instantaneously removed sufficient reactivity. Owing to a misunderstanding, the operator began by withdrawing the control rods at normal speed. This allowed the reactor to reach a higher power than anticipated and resulted in consequent melting of the fuel elements.

Shortly after the accident, there was a rise in the radiation level in the building. The building was evacuated. There were no personnel injuries. There was minor contamination of the sodium potassium coolant. (*See* TID-5360, p. 30.)

BORAX I EXPLOSION

Idaho Falls, Idaho, July 22, 1954

Destruction of the Borax I Reactor released

135 MW-sec of fission energy.

More than 200 safety experiments were made on the Borax I Reactor simulating control rod accidents. For the last test, conditions were set up so that the reactor would be run to destruction.

The tests were carried out by withdrawing four of the five control rods far enough to make the reactor critical at a very low power level. The fifth rod was then fired from the core by means of a spring. In this test, the rod was ejected in approximately 0.2 seconds. After the control rod was ejected, an explosion took place in the reactor which carried away the control mechanism and blew out the core. At half a mile, the radiation level rose to 25 mr/hr. Personnel were evacuated for about 30 minutes.

No one was injured and the destruction of the reactor was part of the cost of the experiment. (*See* TID-5360, p. 29.)

EXCURSION IN AN ENRICHED URANIUM WATER SOLUTION

Oak Ridge Tenn., May 26, 1954

The experiment in progress at the time of the incident was one in a series designed to study criticality conditions of uranium-water solutions in annular cylindrical containers.

The cause of the accident was a displacement of the central tube, effectively a poison rod, to a region of less importance. This displacement resulted from a dislocation of the positioning spider by a pin, used to connect sections of the liquid level indicator rack, protruding beyond the side of the rack and engaging a leg of the spider as the indicator was raised. Removing the compressional force from the top of the central tube allowed it to fall against the inside of the 10-inch cylinder. Although the displacement was small, it was sufficient to cause a large increase in the effective neutron multiplication.

The safety system apparently operated normally and the reaction was stopped automatically. All personnel in the building during the incident were protected by a minimum of five feet of concrete shielding; therefore, no serious exposures were incurred. (*See* TID-5360, p. 18.)

SUPERCRITICALITY EXPERIMENT

Los Alamos, N. Mex., Feb. 3, 1954

The incident occurred in the course of an extensive study of the properties of supercritical radiation bursts produced by an assembly of fissionable metal. This study was covered by a specific procedure. A reference check of critical conditions preceded each supercritical burst.

To attain rapidly sufficient power for a delayed critical check, it was customary to set control rods at the position of minimum reactivity and insert a reactivity booster in the form of a fissionable metal slug. This time, when the booster was inserted, radiation indicators and the assembly temperature recorded went offscale (to return in a few minutes), and scrams were actuated. The resulting shock separated parts of the assembly and damaged steel supporting members.

There was no injury. The property loss was an expenditure of $600 for repair of the assembly. (*See* TID-5360, p. 9.)

SUDDEN INCREASE IN REACTIVITY DURING CONTROL ROD TESTS

Lemont, Ill., June 2, 1952

Manual withdrawal of a control rod from a critical assembly caused an accidental supercriticality.

The operation being conducted was the comparison of a series of newly-manufactured control rods. The assembly had been operated with the standard control rod. It was then shut down by inserting all control rods and draining the water moderator, a standard safe method of shutting down the assembly when core changes are to be made. The standard rod was removed and the first of the series of control rods to be tested was inserted.

The assembly was filled with water with the test control rod fully in and the standard type control rods fully inserted. Withdrawal of one of the standard control rods 32 centimeters caused the assembly to become critical and the power was leveled off while the desired measurements were made. The control rod was then reinserted into the original "in" position.

With the water still in the assembly, the four members of the crew then went into the assembly room for the purpose of replacing the control rod which they had just tested. The group leader went up on the platform, reached out with his right hand and started to pull out the tested rod. As soon as he had withdrawn it about one foot, the center of the assembly emitted a bluish glow and a large bubble formed. Simultaneously, there was a muffled explosive noise. The group leader let go of the control rod which he was removing and it fell back into position. The crew left the assembly room immediately and went to the control room.

Four employees received radiation exposures ranging from 12 to 190 rem. (*See* TID-5360, p. 23.)

CRITICALITY RESULTS FROM ERROR IN CALCULATIONS

Los Alamos, N. Mex., Apr. 18, 1952

Two stacks of fissionable disks were being built up stepwise to give a slightly subcritical assembly with the two stacks brought together by remote control. The individual stacks were built up by hand in fixed assemblies and the two stacks brought together only by remote mechanisms.

After two members of the operating crew calculated erroneously from previous steps that one more disk could be added safely, the disk was added and, with attempted caution, the system was assembled remotely. Radiation indicators went off-scale, actuating scrams, neutron counters jammed, and a puff of smoke was observed on the television viewer. Within three to five minutes indicators and counters returned to operating ranges.

There was no injury, no loss of material, no damage to facilities, and negligible loss of operating time. (*See* TID-5360, p. 7.)

EXCURSION IN A PLUTONIUM NITRATE SOLUTION

Richland, Wash., Nov. 16, 1951

Upon completion of volume measurements, it was thought that some additional information as to the required dilution could be determined by finding where criticality might occur on the rods. The control rod was pulled first with very minor reactivity effect. Following this, the safety rod was withdrawn intermittently at high speed (2.3''/sec). A waiting period for the delayed neutron effect of about 15 seconds was made just prior to the incident. This was too short a time to determine whether or not the assembly was critical. The operators next heard the safety controls actuate, instrument indicators moved offscale, scalers jammed, and the most startling manifestation was that of the breakdown of "counters" playing back through the public address system. The portable "Juno" in the control room was offscale. Presumably, a further rod withdrawal had been made.

There were no injuries. The building was successfully decontaminated, except for the test room and assembly. Before decontamination of this area was completed, a fire occurred and, subsequently, the building was abandoned because of the respread of contamination. (*See* TID-5360, p. 14.)

SCRAM MECHANISM CAUSES CRITICALITY

Los Alamos, N. Mex., Mar. 20, 1951

Interactions between two masses of fissionable material in water were measured at progressively decreasing horizontal separations. Remotely controlled operations established the desired horizontal separation of the two components and flooded the system.

After the final measurement, the system was "scrammed" (a rapid disassembly mechanism was actuated). Safety monitor indicators went off-scale, neutron counters jammed, and the television viewer indicated steaming. Within a few minutes, indicators and counters returned to operating ranges and indicated a rapid decay of radiation.

There was no injury, no loss of material, and no damage to facilities. (*See* TID-5360, p. 13.)

CRITICALITY DURING CONTROL ROD TESTS

Los Alamos, N. Mex., December 1949

The reactor was being remodeled for higher power operation. As part of the required alterations, two new control rods had been placed in the system in addition to the three existing control rods.

The employee who had built the rod control mechanism wanted to test the comparative fall times of these new rods. He opened the enclosure on top of the reactor and manually lifted the rods, neglecting the possibility that this would affect the reactivity of the reactor because of its higher power arrangement. Heretofore, the three existing rods were sufficient for safety.

Normally, rods are raised remotely from the control room when the control panel is activated by a key switch. Since the rods were pulled out manually with the panel being off, no equipment was turned on except a direct reading temperature meter. Therefore, there were no neutron sensitive devices to record or warn of a rise in the neutron level. It was not observed until after the incident that the reactor temperature had risen about 25° centigrade.

The removal of the two rods probably gave a ΔK of about 0.86 percent, producing an initial period of about 0.16 second. Since the measured temperature coefficient is approximately —0.034 percent k/C°, the observed temperature rise indicates the rods were out sufficiently long so that the reactor was stopped by the negative temperature coefficient.

There were no injuries. The employee doing the work received 2.5 rem of gamma radiation according to his film badge. There was no damage done to the reactor and no loss of active material. (*See* TID–5360, p. 21.)

INADVERTENT SUPERCRITICALITY RESULTS IN DEATH

Los Alamos, N. Mex., May 21, 1946

A senior scientist was demonstrating the technique of critical assembly and associated studies and measurements to another scientist. The particular technique employed in the demonstration was to bring a hollow hemisphere of beryllium around a mass of fissionable material which was resting in a similar lower hollow hemisphere.

The system was checked with two one-inch spacers between the upper hemisphere and the lower shell which contained the fissionable material; the system was subcritical at this time.

Then the spacers were removed so that one edge of the upper hemisphere rested on the lower shell while the other edge of the upper hemisphere was supported by a screwdriver. This latter edge was permitted to approach the lower shell slowly. While one hand held the screwdriver, the other hand was holding the upper shell with the thumb placed in an opening at the polar point.

At that time, the screwdriver apparently slipped and the upper shell fell into position around the fissionable material. Of the eight people in the room, two were directly engaged in the work leading to this accident.

The "blue glow" was observed, a heat wave felt, and immediately the top shell was slipped off and everyone left the room. The scientist who was demonstrating the experiment received sufficient dosage to result in injuries from which he died nine days later. The scientist assisting received sufficient radiation dosage to cause serious injuries and some permanent partial disability.

The other six employees in the room suffered no permanent injury. (*See* TID–5360, p. 4.)

FATALITY FROM CRITICAL MASS EXPERIMENTS

Los Alamos, N. Mex., Aug. 8, 1945

During the process of making critical mass studies and measurements, an employee working in the laboratory at night alone (except for a guard seated 12 feet away) was stacking blocks of tamper material around a mass of fissionable material.

As the assembly neared a critical configuration, the employee was lifting one last piece of tamper material which was quite heavy. As this piece neared the setup, the instrument indicated that fission multiplication would be produced, and as the employee moved his hand to set the block at a distance from the pile, he dropped the block, which landed directly on top of the setup.

A "blue glow" was observed and the employee proceeded to disassemble the critical material and its tamper. In doing so, he added heavily to the radiation dosage to his hands and arms.

The employee received sufficient radiation dosage to result in injuries from which he died 28 days later.

The guard suffered no permanent injury. (*See* TID–5360, p. 2.)

UNANTICIPATED CRITICALITY IN WATER-SHIELDED ASSEMBLY

Los Alamos, N. Mex., June 4, 1945

An experiment was designed to measure the critical mass of enriched uranium when surrounded by hydrogenous material. The enriched uranium was in the form of cast blocks of the metal, ½"×½"×½" and ½"×½"×1". The blocks were stacked in a pseudospherical arrangement in 12 courses in a 6"×6"×6" polyethylene box. The voids in the courses were filled with polyethylene blocks of appropriate dimensions. The polyethylene box was supported by a 2-foot-high stool within a 3-foot cubical steel tank. The tank had a 2-inch opening in the bottom through which it could be filled and drained by means of supply and drain hoses attached to a ¾-inch tee. The opening in the tank was fitted with a shutoff valve, as was the drain hose. A polonium-beryllium source of about 200 mc strength was placed on top of the assembly. A fission chamber and a boron proportional counter were used to follow the experiment.

The immediate supervisor was absent from the scene when the experiment was begun. According to one of the operators, the water level was raised above the polonium-berryllium source with the supply valve almost fully open. At this point, a slight increase in counting rate was observed, which corresponded with what had been observed previously when the source alone was immersed in water. A few seconds later, the counting rate began to increase at an alarming rate.

At this point, the supervisor returned, walked to within three feet of the tank and noted a blue glow surrounding the box. Simultaneously, the two operators were hastily closing the supply valve and opening the drain valve. The building was evacuated.

The three individuals involved received excessive radiation exposures, estimated in two cases as about 66.5 rem, and in the third as 7.4 rem. The doses delivered to the head and neck of these individuals may have been considerably greater. They were hospitalized for observation, but no untoward symptoms appeared. No significant changes in blood counts were observed, and sperm counts on one occasion, sometime after the incident, were normal. It is not believed that the individuals concerned received any significant radiation damage. There was no damage to equipment, no loss of active material, and no local contamination problem. (*See* TID-5360, p. 10.)

DRAGON REACTOR EXCURSION

Los Alamos, N. Mex., Feb. 11, 1945

This was the first reactor designed to generate prompt power excursions. Prompt critical was obtained by dropping a slug of UH_3 in styrex through a vertical hole in a small assembly of the same material, which was diluted with polyethylene and reflected by graphite and polyethylene. Near the end of the planned sequence of burst of increasing power, a 6×10^{15} fission burst blistered and swelled the small cubes comprising the assembly matrix. No material was lost, there was no contamination, and there were no exposures.

EXHIBIT M

Applicant's Interrogatory Answers dated 5/20/81

Applicant's Response To Interrogatory No. 8.

Applicant has no information or documentation that would indicate that any specific forms of maintenance have had to increase because of the age of the reactor.

Applicant's Response To Interrogatory No. 9.

Console logic, log N and period amp., area radiation monitors, CIC power supplies, rod position power supply, Argon-41 monitor, secondary effluent monitor, NEL intercom, Compensated ion chamber.

Applicant's Response To Interrogatory No. 10.

Assuming "plans" referse to drawings and tech manuals, the answer is none known.

(CONTENTION XVII)

Applicant's Response To Interrogatory No. 3.

a. Not known.

b. It was moved to NEL, probably in 1968 but the date in not known for sure.

c. Not applicable.

d. Not applicable.

e. No.

f. Unknown.

g. Unknown.

h. Not to applicant's knowledge.

i. Not applicable.

j. Unknown, but possibly the USGS, Menlo Park, California.

k. This likely pertains to accelerometers used in comjunction with the vibration testing studies. Applicant does not know precisely where they were placed.

Applicant's Response To Interrogatory No. 4.

Applicant is aware that the State of California Division of Mines and Geology placed approximately ten accelerometers in or on the Math-Science Structure directly above the reactor building sometime in the late 1970's. This activity was not related to reactor operations but apparently to the fact that the Math-Sciences Building has been the subject of several dynamic response tests during and since its construction. To applicant's knowledge the earlier studies were reported in masters thesis which can probably be located in the engineering library under thenames R. Shannman, J. Scott and B. Bunce. Applicant's staff have not examined this literature. To applicant's knowledge the Division of Mines is using Kinemetrics accelerometer systems, Model CR-1, although it is believed that no records have been generated yet by this system since its installation. Apparently the testing is part of a larger sample testing of buildings in Los Angeles that is being conducted by the Division of Mines. H. LaGesse of the Division of Mines is the individual who services the instruments and collects any data: California Divisions of Mines, 2811 O Street, Sacramento.

Applicant's Response To Interrogatory No. 5.

Applicant is unaware of any instruments other than those described in the vibration studies of C.B. Smith, those installed by the Bureau of Mines, and the USGS instrument.

a. Not applicable.

Applicant's Response To Interrogatory No. 6.

a. Applicant has no special knowledge of the results. The results should be reported in "A Simulation of Earthquake Effects on the UCLA Reactor Using Structural Vibrators" by Matthiesen and Smith, October 1966.

b. See response above.

c. See response above.

d. No.

e. Unknown.

f. Unknown.

Applicant's Response To Interrogatory No. 7.

a. Applicant objects to the question on the grounds that it is vague, ambiguous and uncertain.

b. None.

c. Unknown, but see operating logs.

d. Not known, but see any reports made from the study referenced in Interrogatory no. 6.

e. Not applicable.

f. Not to applicant's knowledge.

Applicant's Response To Interrogatory No. 8.

a. Yes.

b. None.

c. Unknown.

d. Unknown.

e. Not to applicant's knowledge.

f. Unknown.

g. Not applicable.

h. Not applicable.

i. No.

j. No.

k. Not applicable.

l. There was no reason to believe that that earthquake experience was relevant.

m. None.

n. None.

o. None.

Applicant's Response To Interrogatory No. 9.

a. Applicant objects to the question on the grounds that the question seeks information which applicant cannot provide without conducting extensive scientific and engineering studies and evaluations. The applicant has neither the time, nor the personnel, nor the resources to conduct such studies.

b. See response above.

Applicant's Response To Interrogatory No. 10.

a. In practice, the mass is mass minimized under a constant volume constraint, and the Rudman/Vitti statement represents a more general situation. Realization of the positive reactivity effect requires a physical expansion of the core and the addition of water. There is no contradiction.

b. Not applicable.

c. See response to a, above.

d. Applicant objects to the question on the grounds that the question seeks information which applicant cannot provide without conducting extensive scientific and engineering studies and evaluations. The applicant has neither the time, nor the personnel, nor the resources to conduct such studies.

Applicant's Response To Interrogatory No. 11.

a. No.

b. The statement adds little to the discussion; in any case, applicant was unaware of the particular statement.

c. No.

d. Not applicable.

Applicant's Response To Interrogatory No. 12.

Yes.

a. The system provides demineralized water upon demand.

b. There are three vessels, one of which contains a resin de-ionizing bed. The system volume is not more than 100 gallons.

Applicant's Response To Interrogatory No. 13.

Yes.

a. Applicant objects to the question on the grounds that the question seeks information which applicant cannot provide without conducting extensive scientific and engineering studies and evaluations. The applicant has neither the time, nor the personnel, nor the resources to conduct such studies.

b. See response above.

Applicant's Response To Interrogatory No. 14.

a. The floor panels are approximately 6 inches.

b. Reinforced concrete.

c. Yes.

d. Unknown.

e. Approximately 2000 square feet.

f. Approximately 625 square feet.

g. Unknown.

h. Unknown.

i. Unknown.

j. Unknown.

k. Unknown.

l. Unknown.

m. Unknown.

n. Reinforced concrete of approximately 150 pounds per cubic foot.

o. O; ten tons.

p. It is not.

q. Unknown.

r. Unknown.

s. Yes.

t. Applicant objects to the question on the grounds that the information sought is privileged material that has been held in strict confidence by applicant in order to insure the security of the facility and its contents, including its critical records and documents.

u. Approximately three weeks.

v. Applicant objects to the question on the grounds that it is vague, ambiguous and uncertain.

w. Probably the center.

<u>Applicant's Response To Interrogatory No. 15.</u>

a. Reinforced concrete.

b. Unknown; requires detailed examination of working drawings and specifications.

c. See response above.

d. See response above.

e. See response above.

f. See response above.

g. See response above.

h. See response above.

i. Applicant objects to the question on the grounds that the question seeks information which applicant cannot provide without conducting extensive scientific and engineering studies and evaluations. The applicant has neither the time, nor the personnel, nor the resources to conduct such studies.

j. See response above.

k. See response above.

l. See response above.

m. See response above.

n. See response above.

o. See response above.

p. See response above.

Applicant's Response To Interrogatory No. 16.

Applicant objects to the question on the grounds that the question seeks information which applicant cannot provide without conducting extensive scientific and engineering studies and evaluations. The applicant has neither the time, nor the personnel, nor the resources to conduct such studies.

a. See response above.

b. Not applicable.

c. Not applicable.

d. None; applicant does not know the "largest capable fault" although applicant assumes the Inglewood fault is the most likely seismological feature to cause a severely destructive earthquake at UCLA.

Applicant's Response To Interrogatory No. 17.

Unknown to applicant.

a. Not applicable.

b. Not applicable.

c. Not applicable.

d. Not applicable.

Applicant's Response To Interrogatory No. 18.

Unknown to applicant.

a. Not applicable.

b. Not applicable.

c. Not applicable.

d. Not applicable.

Applicant's Response To Interrogatory No. 19.

No.

a. Not applicable.

b. Not applicable.

c. Not applicable.

d. Not applicable.

Applicant's Response To Interrogatory No. 20.

No.

a. Not applicable.

b. Not applicable.

c. Not applicable.

d. Not applicable.

Applicant's Response To Interrogatory No. 21.

Not to applicant's knowledge.

a. Not applicable.

b. Not applicable.

c. Not applicable.

Applicant's Response To Interrogatory No. 22.

The seismic scram interlocks are not specifically earthquake sensors, and are referred to by applicant as "closure sensors." They are conventional microswitches, six in number, wired in series, and are actuated by displacements of the shield blocks.

a. Assuming the sensor is actuated, the sensor response time is almost instantaneous. The shut down time in dictated by rod drop time (less than one second) or time to dump core water (approximately 20 seconds to dump 20% of the water). After either of these events, the power level will decay exponentially from the prompt-drop level on an 80 second period.

b. Displacements of approximately one-eighth to three-sixteenths inches will actuate the sensors.

c. Not to applicant's knowledge.

d. Circuit continuity is checked prior to each reactor start-up. Positioning is checked whenever shield blocks are moved for core maintenance.

e. Not applicable.

f. Not to applicant's knowledge.

g. None, except for what applicant has mentioned in response to these interrogatories.

h. None.

i. No.

j. Yes.

k. Unknown.

l. None.

m. Applicant is undecided at this time and will make a determinaton as to the documents it will produce only after a request for production is received.

Applicant's Response To Interrogatory No. 23.

Applicant makes no contention.

a. Not applicable.

b. Not applicable.

c. Not applicable.

Applicant's Response To Interrogatory No. 24.

Not applicable.

a. Not applicable.

b. Not applicable.

c. Not applicable.

Applicant's Response To Interrogatory No. 25.

Not applicable.

a. Not applicable.

b. Not applicable.

c. Not applicable.

Applicant's Response To Interrogatory No. 26.

a. Yes.

b. Those that would bond (in tension) the foundation to any underlying soil that might be hypothesized to accelerate downward at more than one g.

c. Applicant's response is not based on any specific facts, information or documents but instead on the absence of any facts, information or documents which would contradict applicant's response. Applicant is undecided at this time and will make a determinaton as to the documents it will produce only after a request for production is received.

d. Anything less than one g. The facts are normally expressed by the physical laws of Sir Isaac Newton (1642-1727), English mathematician and natural philosopher.

e. Unknown in the directions specified.

f. Not applicable.

g. See Exhibit B.

h. It is a general observation to the effect that most soils have negligible tensile strength. Applicant's response is not based on any specific facts, information or documents but instead on the absence of any facts, information or documents which would contradict applicant's response.

i. It is a general conclusion based upon the stated premises and has no other independent documentation.

j. Not to the knowledge of applicant's staff.

k. Applicant objects to the question on the grounds that it is vague, ambiguous and uncertain.

l. Unknown.

m. Unknown.

n. No.

o. Applicant objects to the question on the grounds that it is vague, ambiguous and uncertain.

p. Unknown.

q. No.

Applicant's Response To Interrogatory No. 27.

Applicant objects to the question on the grounds that the question seeks information which applicant cannot provide without conducting extensive scientific and engineering studies and evaluations. The applicant has neither the time, nor the personnel, nor the resources to conduct such studies.

Applicant's Response To Interrogatory No. 28.

None to applicant's knowledge.

Applicant's Response To Interrogatory No. 29.

None to applicant's knowledge.

Applicant's Response To Interrogatory No. 30.

None to applicant's knowledge.

a. None.

b. Unknown.

c. None.

Applicant's Response To Interrogatory No. 31.

Unknown.

a. None.

b. Not applicable.

Applicant's Response To Interrogatory No. 32.

Applicant is not; the items are merely relevant factors.

a. Nothing to applicant's knowledge.

b. Nothing to applicant's knowledge.

c. None.

Applicant's Response To Interrogatory No. 33.

Unknown.

Applicant's Response To Interrogatory No. 34.

Unknown.

a. Unknown.

b. Not applicable.

Applicant's Response To Interrogatory No. 35.

To applicant's knowledge the only data that may be in existence relates to routine maintenance reports, work orders, etc. Applicant is undecided at this time and will make a determinaton as to the documents it will produce only after a request for production is received.

Applicant's Response To Interrogatory No. 36.

Applicant's staff believes that the attribution of a water leak to the earthquake was found, upon core entry, to be either erroneous or at least not clearly related to the earthquake. Applicant's staff believes that the leak source was ultimately traced to corrosion in piping that was embedded in concrete below the core rather than piping or fuel box failure within the core. To the extent that the applicant has knowledge of the information requested it is contained in applicant's records and documents, although such records and documents are likely to be incomplete particularly for the earlier years of reactor operations. The following records and documents are the main sources of such information as applicant has available: documents no. 1, 2, 3, 5a and 10.

a. See response above.

b. See response above.

c. See response above. Applicant has observed that the imbedded piping was abandoned and new piping was substituted by core drilling for passage through the concrete. New fuel boxes were built to adapt to the new piping.

d. See response above. Applicant is undecided at this time and will make a determinaton as to the documents it will produce only after a request for production is received.

Applicant's Response To Interrogatory No. 37.

a. The information requested can be found in the following records and documents: document no. 41.

b. See response above.

c. See response above.

d. See response above.

e. Unknown.

f. Unknown.

g. None.

h. See a above.

Applicant's Response To Interrogatory No. 38.

Approximately one-eighth inch.

Applicant's Response To Interrogatory No. 39.

To the extent that the applicant has knowledge of the information requested it is contained in applicant's records and documents, although such records and documents are likely to be incomplete particularly for the earlier years of reactor operations. The following records and documents are the main sources of such information as applicant has available: document no. 1.

Applicant's Response To Interrogatory No. 40.

Unknown.

Applicant's Response To Interrogatory No. 41.

None to the knowledge of applicant's staff.

Applicant's Response To Interrogatory No. 42.

Not to applicant's knowledge; it is unlikely that the Uniform Building Code was in effect.

Applicant's Response To Interrogatory No. 43.

Unknown.

Applicant's Response To Interrogatory No. 44.

The Daily Bruin article is in error. The University has contracted with outside consultants to prepare a study of UC buildings. The study is to establish priorities for the funding of seismic studies by the state in the future. The current study is not a seismic study at all. The study is in progress but it is expected that the study will be completed and reported to the state within the next several months. The buildings will apparently be ranked according to square footage, occupancy, type construction, reconstruction costs and other factors. The entire "findings" for each building will be contained on a single line entry and will consist only of the type factors mentioned above. On the basis of the rankings the state will decide for which buildings it will fund seismic studies.

a. See response above.

b. See response above.

c. Unknown.

d. None.

e. Applicant is undecided at this time and will make a determinaton as to the documents it will produce only after a request for production is received.

<u>Applicant's Response To Interrogatory No. 45.</u>

Unknown.

a. Not applicable.

b. Not applicable.

<u>Applicant's Response To Interrogatory No. 46.</u>

Unknown.

a. Not applicable.

b. Not applicable.

<u>Applicant's Response To Interrogatory No. 47.</u>

Unknown.

a. Not applicable.

b. Not applicable.

Applicant's Response To Interrogatory No. 48.

No information is required.

a. Not applicable.

Applicant's Response To Interrogatory No. 49.

Not to the knowledge of applicant's staff.

(CONTENTION XVIII)

Applicant's Response To Interrogatory No. 3.

Applicant objects to the question on the grounds that the information sought is privileged material that has been held in strict confidence by applicant in order to insure the security of the facility and its contents, including its critical records and documents. Academic reviews are part of the peer review process which is deemed to be confidential by the applicant. Moreover, the academic reviews of the School of Engineering and Applied Science are not relevant to the financial qualifications of the applicant, The Regents of the University of California.

a. Applicant is undecided at this time and will make a determinaton as to the documents it will produce only after a request for production is received.

EXHIBIT G

NUREG/CR-2198

Fuel Temperatures in an Argonaut Reactor Core Following a Hypothetical Design Basis Accident (DBA)

Prepared by

G.E. Cort

June 1981

Los Alamos National Laboratory
Los Alamos, NM 87545

for the

Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

NRC FIN A7122

the "graphite stack can safely withstand the 0.25 G maximum earthquake loading". The review also concluded that vertical motion was unlikely to dislodge the stack of graphite blocks and that large deformations in any direction would be resisted by the biological shield.

The acceleration forces that should be applied to the ARGONAUT for seismic analysis will depend on local conditions such as the distance from the nearest fault. Therefore, it cannot be estimated whether 0.25 g's ground acceleration would be conservative or unconservative. However, if we assume an extreme acceleration of 1 g's, the maximum compressive stress in the graphite is still less than one-tenth the compressive strength. Because the blocks are not interlocked, tensile stresses should not occur. There may be some chipping at corners and abrasion from compressive shear, but these small changes in geometry should not adversely affect the heat transfer. Horizontal acceleration can cause the graphite blocks to slide against the metal fuel boxes and, if the impact is severe, crush the box and the fuel elements laterally. The probability and extent of crushing cannot be predicted without dynamic structural analysis. The dynamic analysis of the seismic response of an HTGR core (Ref. 1) that was completed at Los Alamos in 1975 is an example of the type of modeling needed to predict lateral crushing. It is interesting that the maximum impact force between adjacent graphite blocks with a 1 g's horizontal base acceleration was calculated as 0.3 MN (67,000 lb). If this analysis were to hold for the ARGONAUT, lateral crushing seems possible under the severe acceleration.

The core might also be crushed in the vertical direction by falling lead bricks, access plugs, fuel box shielding plugs, or the massive removable concrete shield blocks. These components are interlocked and supported by the reinforced concrete shield. Even though the concrete in the shield may crack and spall, it is difficult to imagine that large displacements could occur that would allow these interlocked components to fall.

In summary, crushing in the lateral direction seems possible under severe accelerations, and crushing in the vertical direction seems less likely. Any crushing that takes place will tend to "squeeze the air out" from between the fuel plates so that heat conduction to the surrounding graphite will be improved relative to the uncrushed state.

emphasis added