

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION V

Report No. 70-754/80-04
Docket No. 70-754 License No. SNM-960 Safeguards Group 1
Licensee: General Electric Company
Vallecitos Nuclear Center
P. O. Box 460
Pleasanton, California 94566
Facility Name: Vallecitos Nuclear Center
Inspection at: Pleasanton, California
Inspection conducted: July 7-10, 1980
Inspectors: William J. Cooley 8/22/80
W. J. Cooley, Fuel Facilities Inspector Date Signed
R. D. Thomas 8/25/80
Approved by: R. D. Thomas, Chief, Materials Radiological Protection Date Signed
Section
Approved By: H. E. Book 3/25/80
H. E. Book, Chief, Fuel Facility and Material Safety Date Signed
Branch

Summary:

Inspection on July 7-10, 1980 (Report No. 70-754/80-04)

Areas Inspected: Organization; modifications and changes to facilities and systems; internal review and audit; safety committee activities; employee training; operations review; criticality safety; environmental programs; and confirmatory measurements. The inspection involved 26 inspector-hours onsite by one inspector.

Results: No item of noncompliance or deviations were identified in the subject areas inspected.

RV Form 219 (2)

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DETAILS

1. Persons Contacted

R. W. Darmitzel, Manager, Radiation Processing Operation
W. H. King, Manager, Nuclear Safety
*G. E. Cunningham, Senior Licensing Engineer
D. C. Bowden, Nuclear Safety Compliance Engineer, Nuclear Safety
W. R. Lloyd, Senior Engineer, Nuclear Safety
P. S. Webb, Manager, Radiological and Environmental Protection
C. A. Hooker, Specialist, Radiological and Environmental Protection
R. E. Butler, Manager, Radioactive Products and Services
D. L. Zimmerman, Radioactive Products and Services Analyst
L. A. Hanson, Manager, Isotope Product Fuel Recovery and Irradiation
J. I. Tenorio, Manager, Remote Handling Operations
M. L. Thompson, Manager, Advanced Fuels Laboratory
T. E. Ludlow, Advanced Fuels Laboratory Superintendent
R. D. Reager, Chemist

*Denotes those attending the exit interview.

2. Organization

E. F. Kurtz, former Manager, Advanced Fuels Laboratory has left that position. M. L. Thompson is presently Acting Manager, Advanced Fuels Laboratory. R. C. Gebhart is Manager of Laboratory Operations and T. E. Ludlow, is the Advanced Fuels Laboratory Superintendent.

R. E. Broz, Training and Emergency Coordinator, Radiological and Environmental Protection has terminated. At the time of his termination his responsibilities included conduct of the employee training program, Emergency Coordinator, and Environmental Protection Specialist. E. J. Strain, Engineer, Nuclear Safety Technology has been named Emergency Coordinator for the Vallecitos Nuclear Center Site. The employee training function is presently being shared by Messrs. P. S. Webb, R. L. Morgan, and D. C. Bowden. The environmental program is being conducted by Mr. Webb and H. C. Mohr, former Environmental Specialist.

A new environmental specialist has been selected from site personnel. That individual has 25 years experience in the nuclear field, 15 years of which is onsite experience including work in environmental chemistry.

A requisition has been submitted for an individual to conduct the employee training program.

A requisition has been submitted for three additional Health Physics Monitor positions. Two of those positions have been approved and filled while the management decision is awaited on the third request. With the two approvals a compliment of seven Health Physic Monitors is available to Mr. Webb.

3. Modifications and Changes to Facilities and Systems/Change Authorization Procedure

The licensee is decommissioning the Advanced Fuels Laboratory. The decommissioning is scheduled for completion by about December 1981. Glove boxes and other equipment had been decontaminated and removed from the wet chemistry portion of the laboratory. At the time of this inspection equipment had been decontaminated and removed from glove boxes in the ceramic line. Those boxes had been decontaminated to various degrees and were being prepared for packaging and shipment to a waste burial site.

The Advanced Fuels Laboratory decommissioning program is being controlled by Change Authorization. Because of the complexity of the decommissioning, that authorization was being changed progressively by amendments and additions. An authorization began with a plan for test decontamination of the glove box. The plan included a requirement for the development of acceptable decontamination procedures; presented the format of records of surveys to be kept; presented the decontamination limits; and presented the required instrument calibrations and proposed decontamination methods. An addition to the Change Authorization file presented a method for handling large metal parts of equipment to be removed from the glove boxes; a recalculation of the permissible remaining plutonium in a box with respect of the use of a DOT type 7A container; and calculations to determine if the total remaining transuranic activity would meet the 10 nanocurie per gram requirement in land burial licenses. An extended decommissioning plan for the Advanced Fuels Laboratory along with the official test results on decontamination of glove box number 35 were included in the Change Authorization file.

The mixed-oxide chemical line and the scrap recovery line remained intact in the wet chemistry portion of the Advanced Fuels Laboratory.

Inventory of fissile material had been reduced considerably in that laboratory.

The licensee had removed all fissile material from the Building 105 vault and from the building 105 Critical Experiment Facility. The Critical Experiment Facility was being used by the Advanced Fuels Laboratory for the installation of a metal frame and chemical train to study the destruction of various chemical wastes associated with processes which have been developed at the Advanced Fuels Laboratory. The work planned in the Critical Experiment Facility is with nonradioactive material. At some future date the equipment installed in the Critical Experiment Facility will be relocated to Advanced Fuels Laboratory at which time the experimentation would continue using naturally occurring radioactive material and perhaps depleted uranium.

The licensee has completed the decommissioning of the Development Shop located in building 106 at the Vallecitos Nuclear Center. That decommissioning was accomplished using the licensee's Change Authorization Procedure. This inspection included review of that Change Authorization and of the direct reading and smear type survey that was made of the building 106 shop. Permissions and conditions concerning the decommissioning were filed in the Change Authorization file. They included deactivation of criticality limit areas; deactivation of the criticality detector; removal of signs and postings; deactivation of air sample monitors;

permission to remove the HEPA filters; requirement that the building 106 exhaust fans remain activated; and the requirement of quarterly surveys to determine if radioactive materials are introduced into building 106. The Change Authorization included a direct and smear type survey for alpha and beta activity in the building 106 and a certification of the accuracy of that survey as well as certification of "0" contamination of special nuclear material in that building. A special requirement was retained in that the critical alarm system was required to remain active for use with Special Nuclear Material in association with the x-ray equipment located in building 106 shop. A limit of approximately 235 grams contained U-235 was placed on the x-ray room location.

The decommissioning was treated as a temporary deactivation and conditions were placed upon reactivation of the Development Shop with the use of radioactive materials. The conditions were that a new Change Authorization was required; air samplers were to be restarted, posting was to be accomplished as required; routine surveys were to be reinstated; and the HEPA filters were to be restored and tested.

4. Internal Review and Audit

Criticality safety audits are performed by the Senior Engineer, Nuclear Safety. The frequency of those audits varies from area to area dependent upon the hazard potential. This inspection included a review of the records of criticality safety audits conducted from approximately December 1978 thru March 31, 1980. Over that period of time 16 audits were made. On three occasions deficiencies in posting criticality limits were discovered and corrected.

A second type of criticality safety audit is conducted by the Health Physic Monitors in the Radiological and Environmental Protection Unit. Those audits are conducted monthly and are addressed to SNM inventory control, housekeeping, posting, and criticality alarm operability. This inspection included a review of the records of audits of that type. The audits had been conducted in buildings 102, 103, 105, as well as the Advanced Fuels Laboratory, Plutonium Analytical Laboratory and various storage facilities onsite. During an audit of certain plutonium facilities on October 29, 1979, a critical alarm check was found to be missing for the month of September 1979. That check had been accomplished on October 3, 1979.

This inspection also included a review of records of radiation safety audits which have been conducted by a Nuclear Safety Compliance Engineer. Those audits were conducted during the period of approximately December 1978 through June 1980. Those audits addressed use of radiation producing machines and radioactive materials which were of interest to the State of California and the NRC. The following list includes most of the subjects audited followed by the number of times the subject was addressed (in parentheses) over the review period. Use of x-ray machines (2); audits of criticality limit areas and associated posting (3); visual inspection of HEPA filters (4); audit of Vallecitos Nuclear Center Employee Training and Training Program (4); Area radiation safety audits (2); Followup on

recommendations for improvement (2); Status of 1978 criticality drill recommendations for improvement (1); Status of DOP tests (1); Status of change authorizations (1); Status of 1979 investigations (1); status of calibration of Vallecitos Nuclear Center Dosimetry instruments and hand and foot backgrounds (2); Audit of respiratory protection program (1); and site posting review (1).

The most recent problems encountered were the development of a backlog of employees for whom requests for training and retraining has been received. A backlog of instruments to be calibrated and repaired was also developing.

In September 1979 a more formalized approach to the radiation safety audit program was instituted. As a minimum audit program the following subjects were to be addressed on an annual basis: employee training, respiratory protection program; change authorization followups; investigation followups; isotope use authorizations; emergency plans and procedures; waste handling; and calibration of instruments. Additional subjects to be addressed on a biennial basis were ventilation; high radiation alarm systems; posting and labeling; criticality limit area posting; verification of licenses; radiation and environmental protection procedures and practices; standard operating procedures; exposure and bioassay records; and coding of piping and lines.

The review of radiation safety audits indicated that well written and clear reports on the audits are produced. Problem areas are recognized and correction is accomplished.

5. Safety Committee Activities

This inspection included a review of minutes of meetings of the Vallecitos Technical Safety Council dating from September 1979 thru March 1980. The meetings were announced by letter to council members which included a meeting addenda. The meetings were held at quarterly intervals. Attendance at the meetings was recorded and included participation by nonmembers of the council.

Over the period of review the subjects discussed included the ALARA concept and goals; waste handling problems; fire prevention and emergency planning; the California Water Quality Control Board Water Discharge Permit; respiratory protection employee retraining; and the decommissioning plans for the Advanced Fuels Laboratory.

The individual employee whole body dose ALARA goal for the year 1980 was set at 3 rem. The present exposure rate at the Vallecitos Nuclear Site is approximately 73 man-rem/year.

6. Employee Training

The following courses of instruction are available in the Vallecitos Nuclear Center Employee Training Program.

- a. New hire orientation course. Four hours of class lecture followed by a test. A 17 page textual handout is furnished to the employee for reading and includes 16 references of the subject of radiation. The test consists of six questions.

- b. The most intensive course in radiation of nuclear safety at the Vallecitos Nuclear Center is titled Radiation Safety at Vallecitos Nuclear Center. The course is required within 1 year of hire of any individual working routinely with radioactive materials. Twenty-four hours of classroom lecture time is devoted. A fifty page training manual assembled by R. L. Morgin is used as a text. A test and passing grade is required. The test is closed book and consists of 45 questions including essay, multiple choice, and word matching types.
- c. A short course in Radiation Protection Fundamentals consisting of four hours of class lectures and a test is available to employees who do not normally work with radioactive materials. The course outline is similar to a. above and includes the same references for the study of radiation. The test consist of 25 questions including true or false, word match, and fill blank types.
- d. A course specific to criticality safety is available and consists of about four hours of class lecture time. The course outline consists of approximately 25 pages including criticality accident histories; a bibliography; and discussions of the various parameters which must be controlled to preclude a criticality. The test consists of 25 questions which are again an admixture of multiple choice, true and false, essay, and blank fill.
- e. Respiratory protection training is a course given on an as needed basis. Classroom lecture time and demonstration is about eight hours. The course outline addresses the prevention of internal deposition, metabolism, critical organs, chronic exposure, single incident, and detection methods for internal exposure. The test consists of six true/false; four multiple choice, six essay/discussion and eight additional questions.
- f. A course on radiation detection instruments is available on an as-needed or as-requested basis by personnel working at GETR, RML and Advanced Fuels Laboratory. A test is given.
- g. Reactor Operations Health Physics is available on an as-requested basis requested by employees at GETR and is accompanied by a test.
- h. A course entitled High Dose Rate Training has been devised for special work such as decontamination involving high dose rates. It consists of eight hours of class lecture followed by a test.
- i. Other special classes approved as retraining courses may be devised at the request of management.

Retraining is scheduled once each two years for those workers exchanging personnel dosimeters at monthly frequency.

7. Operations Review

This inspection included visits to Building 103, Chemistry and Metallurgy; Building 102, Hot Cell Operations and Advanced Fuels Laboratory; Building 105, formerly Vault Storage Facility; Building 400, Natural Uranium Waste Recovery Studies; and the waste treatment facility at the southern most border of the Vallecitos Nuclear Center Site.

The Building 103 vault was being used for the storage of uranium of various enrichments. Appearance of various laboratories in that building was generally good with the exception of laboratories 209 and 210 which had a cluttered appearance. The fuel storage facilities in Building 105 (plutonium clad vault and Critical Experiment Facility) were no longer being used for the storage of fuel. The Critical Assembly Facility was being used for certain Advanced Fuels Laboratory chemistry studies. Some plutonium was stored in the Advanced Fuels Laboratory vault. The Advanced Fuels Laboratory was being decommissioned and several ceramic line glove boxes had been decontaminated.

Cells 1, 2 and 5 in the hot cell complex of Building 102 were in use in the study of spent fuel elements. Cells 3 and 4 (medical isotope and alpha emitter cells) were not being used. The waste treatment plant at the southern border of the Vallecitos Nuclear Center Site was visited. Only one of four, 60,000 gallons retention basins were in use at the time. Basin A-2 was filled to about 30,000 gallons. Opportunity was taken to obtain two liquid waste samples. General Electric Company personnel obtained an additional two samples from the same basin and intends to have them analyzed for radioactive constituents. The results of the NRC analytical work will be presented as a addendum to this report when those results have been received.

8. Criticality Safety

The licensee has begun a program of restudying all nuclear safety analyses pertaining to operations at the Vallecitos Nuclear Center. The plan is to show that the use of this material in any area will not result in a criticality accident even if all fuel in that area is rearranged in its most reactive configuration. At least two analyses of that type have been accomplished and this inspection included a review of the reports of that analytical work.

The two contingency criteria for the reanalysis of the Building 103 fissile material vault postulates a seismic event in which all that fissile material is brought together simultaneously. Additionally, as the material is brought together it is configured in its most reactive geometry. In one model three 2R pipes are assumed to come together in triangular pitch and then fissile material external to those pipes is allowed to rap itself around the pipes in layers according to the enrichment of the fuel. Varying amounts of moderator is then introduced to this system to determine the maximum keff for optimum moderation and full water reflection. In a second model fuel external to the three 2R pipes is allowed to come together in layers according to enrichment in a cylindrical geometry and the three 2R pipes are assumed to assemble themselves around that fuel in close-packed array. Again, moderator is introduced to determine the maximum keff for optimum moderation and full water reflection.

The three 2R pipes are the central containers of model 6M shipping containers. Their contents are limited by mass and enrichment and all structural material of the 6M shipping container is assumed to be lost in order to bring the pipes together. Moderator is introduced into the pipes in increments to determine the most reactive pipe loading and the corresponding height of fuel in the pipe.

Layers of various enrichments of fuel are placed around the pipes with fuel enrichment decreasing as the radius of the assembly increases. Full water reflection of the model is used in each case. The analysis of the model was accomplished by the KENO - IV criticality code.

For enrichments less than five percent a correction was introduced in the calculation to account for clumping of the low enriched material in the models.

Under the above postulated conditions the entire vault loading was found to be subcritical.

The analysis included an interaction calculation for the normal vault loading. The report included a plan view of the building 103 vault loading limits and a print out of the interaction calculation. The date of completion of the analysis was February 28, 1980.

The licensee accomplished a second analysis of a similar type for Radioactive Materials Laboratory cells number 1 and 2. In this case a spherical model of fissile material layered by enrichment was used. As in the case of the building 103 vault, a correction was made for the greater reactivity of heterogeneous, moderated systems of enrichment less than five percent. The H/U-235 ratio was varied and the most reactive, reflected, and moderated system was shown to be less than individual cell fissile material inventory limits.

All permitted fissile units in cells 1 and 2 were considered in an interaction calculation and were shown to be subcritical. The report included a statement of cell limits along with a plan view of the cells and details of the interaction calculations.

9. Environmental Surveillance Program

Since the last inspection, the licensee has considered a reduction in the number of samples acquired as part of the environmental program. A summary of the study along with a proposed revised program was presented by Radiation and Environmental Protection to Nuclear Safety Technology on March 28, 1980. A licensee's Change Authorization procedure was used to review the proposals and final approval for the changes was granted by management on June 2, 1980.

The study included a review of environmental data as published in annual summary reports for the years 1971 through 1979 for samples in the categories of vegetation, stream bottom, soil, aquatic vegetation, and cloud gamma dosimetry. That data indicated no accumulation or reconcentration over the period of the review and taken along with a reduced activity as the Vallecitos Nuclear Center resulted in the approved reduction in the program. No reduction in the number or types of samples required by California Regional Water Quality Control Board Discharge Permit was permitted. The following TABLE I presents the environmental program prior to the changes and indicates the changes instituted.

TABLE I

Environmental Program Prior to
June 2, 1980

Changes in the Basic
Environmental Program

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| a. Liquid effluents discharged from the site analyzed for Pu-239, SR-89/SR-90, Tritium, Cobalt 60, Iodine 131. | No change. |
| b. Airborne particulate and gaseous stack effluents analyzed for alpha, beta-gamma, noble gas, Iodine-131. | No change. |
| c. Water analysis from streams crossing the Vallecitos Nuclear Center Site, Vallecitos Creek, Arroyo de la Laguna, and Alameda Creek, analysis for alpha, beta-gamma, and tritium. | No change. |
| d. Various well water from wells both onsite and offsite, analyzed for alpha activity and beta-gamma activity. | No change. |
| e. Stream sediment samples analyzed for Cobalt 60, Cesium 137, Strontium 90, plutonium 239, and potassium 40.

The sediment samples analyzed for:

Alpha, beta-gamma, strontium-90, cesium 137, cobalt 60, and potassium 40. | Retain onsite sample, basin outfall sample, Vallecitos Creek offsite sample, and Alameda Creek offsite sample. Eliminate site lake bottom sample. Reduce frequency of two additional offsite stream bottom samples from monthly/annually to annually. |
| f. Soil samples analyzed for alpha, beta-gamma, strontium 90, cesium 137, cobalt 60, and potassium 40. | Eliminate all soil samples from the program. |
| g. Cloud-gamma TLD measurements, measurement of cloud-gamma radiation at 31 stations on the Vallecitos Nuclear Center Site. | Reduce all cloud gamma analyses from monthly/quarterly to annually with the exception of station number 1 (water tank above hillside storage). |
| h. Perimeter air sample stations analyzed for alpha, beta-gamma, and Iodine 131. | No change. |
| i. Vegetation samples analyzed for alpha, beta-gamma, strontium 90, Iodine 131, cesium 137, cobalt 60 and potassium 40. | Of the total of 20 vegetation samples, eliminate all three marine flora samples (aquatic flora); eliminate a total six additional onsite and offsite vegetation samples; reduce the frequency of an additional nine offsite and onsite vegetation samples from monthly/annual to annual sample only. |

The above changes in the environmental program are primarily a reduction in the number and frequency of each sample type except for soil sampling. Soil samples have been eliminated from the program.

The Change Authorization review of the program changes recommended not only further reductions in the environmental program as might be justified by further reduction in activity at the Vallecitos Nuclear Center but also recommended increases in the environmental monitoring program if any increase in site activities from those currently being conducted might occur.

10. Management Interview

The scope and results of this inspection were discussed with Mr. G. E. Cunningham on July 10, 1980. The licensee was informed that no items of noncompliance and no deviations were observed within the scope of the inspection.