GENERAL ELECTRIC COMPANY

ATOMIC PRODUCTS DIVISION

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ATOMIC POWER EQUIPMENT DEPARTMENT

July 20, 1962

Postmarked 7/25/62

Mr. Edson G. Case
Assistant Director, Facilities Licensing
Division of Licensing and Regulation
Atomic Energy Commission Washington 25, D.C.

Dear Mr. Case:

Investigations having been completed, descriptions of three incidents involving release of radioactive material to the containment vessel of the General Electric Test Reactor are reported in view of the Commission's interest in obtaining information regarding such occurrences.

Incident Number 1

On June 11, 1962 at 1404 an evacuation of the GETR containment vessel was made due to a release of radioactive material to the containment vessel atmosphere. The release occurred when a gas sample was drawn from a capsule being irradiated in the reactor core.

The reactor was operating at thirty megawatts. The capsule area operator, under the direction of a General Electric test engineer, and under observation of the customer's design engineer, was in the process of extracting gas samples from the capsule purge stream. A written and approved procedure was being followed. This procedure was scheduled as a daily routine, and had previously been performed successfully.

With one sample drawn, and the preparations nearly complete to draw the second sample, the building constant air monitors rose rapidly. At approximately the same time, a slight rise in particulate activity was noted on the building exhaust air monitor. All personnel were immediately removed from the building. At 1420, the building was re-entered by an operator and monitor, wearing fresh air breathing apparatus, to return the capsule to a normal valving sequence, and to draw air samples.

The air activity was determined to be of short half-life material (around 20 minutes). The maximum personnel contamination of skin or clothing was 2,000 CPM.

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All cases of contamination were either cleaned or decayed below one hundred counts per minute within two hours.

Four cases of nasal contamination were detected. Maximum count detected was 114 CPM above background. All four cases were decontaminated or decayed to background within one hour. Maximum detectable air activity from air samples in the building was 4.4×10^{-7} uc/cc. Maximum surface contamination detected was 1,000 CPM. Surface contamination on floors decayed to less than 100 CPM within a few hours.

The containment building was released for normal entry at 1525.

A program of leak checking the sample system was initiated the following day and on June 19, 1962 another set of samples were attempted. This time all personnel not required for the sampling were removed from the containment vessel. The personnel sampling were equipped with fresh air and protective clothing. The samples were taken successfully, however, the continuous air monitor (CAM) located on the third floor indicated a release of radioactive material (maximum reading 1.4×10^{-8} uc/cc). The source of the release was apparently the vacuum pump fittings. These fittings have since been made leak tight.

Subsequent samplings of the capsule have been successful and no further release of radioactive gas to the containment vessel has occurred from the capsule sampling system.

Incident No. 2

On July 3, 1962 at approximately 2000 hours, the GETR containment vessel was evacuated due to the release of radioactive gas resulting from the failure of a trail cable facility capsule.

A fuel pin was undergoing irradiation in the reactor trail cable facility. The fuel pin holder lead cable was attached to an oscillating machine that would periodically insert the pin into the flux and then withdraw it. This experiment has been done several times in the past using similar type fuel pins. Detailed written procedures are prepared prior to each irradiation and only trained operations personnel are assigned to these programs. Shortly after this particular irradiation started, the fuel pin failed. A radiation monitoring chamber upon sensing 900 mr/hr at the experiments cooling leads, tripped and automatically stopped the oscillating machine with the fuel pin withdrawn from the high flux as it was designed to do. In the past when a fuel pin failed, as it may in this type of experiment, the dose rates around the oscillating machine were such that an operator could enter the area, disconnect the fuel pin lead from the machine and pull the experiment further up in the facility tube until it was completely out of the flux. In this particular event, however, the dose rate 12 feet from the fuel pin lead was 200 mr/hr, supporting a conclusion

that failure was more sudden and severe than previously encountered and involved fuel pin cladding.

About two hours elapsed before the activity decayed to a level whereby exposure rates were such that the operator could enter the area and pull the fuel pin completely out of the flux. During this waiting period radioactive gas escaped from the experiment into the containment atmosphere. The local continuous air monitors started alarming at 2045 at which time the containment vessel was evacuated. Operators re-entered at 2150 in SWP clothing and assault masks and pulled the experiment completely out of the flux. Maximum dose rates during this activity were 1.5 r/hour. Continuous radiological monitoring was provided during this operation. Clean-up of the fuel pin cooling system was initiated by diverting the flow through two ion columns and a gas separator which reduced the dose rates considerably.

The containment vessel went on assault mask status at 2045, 7/3/62, fresh air at 0045, 7/4/62, back to assault mask at 0530, 7/4/62 and off masks completely at 1050, 7/4/62. The maximum measurable air concentration reached during this event was 3.1×10^{-6} uc/cc. The maximum smearable contamination was 15,000 c/m on the normally clean third floor area. The half-life of the containment atmosphere was 20 minutes. The concentration of air activity during this event did not result in a containment vessel isolation.

There was no personnel contamination or over exposures during this event.

The high dose rates associated with the failure of this fuel pin was attributed to actual failure of the fuel pin cladding. In previous fuel pin irradiations the cladding did not fail. An analysis of the fuel pin failure will be made during a post-irradiation study in the hot cell.

The present oscillating machine will be modified to facilitate remote removal of failed experiments from the flux before further irradiations of this type are conducted.

Incident No. 3

On July 8, 1962, at about 1630 hours, a capsule started releasing radioactive gas to the GETR containment vessel and at 1638, it was necessary to evacuate personnel from the vessel. The events associated with the gas release from this experiment are described as follows:

The capsule contains uranium, thorium, C_2 fuel compacts and the test section of the experiment is positioned within the reactor core. Associated with the experiment is a fission product gas sampling system designed to obtain fission product release data from the fuel compact. Additionally, the experiment is provided with a separate helium-nitrogen temperature control system whereby the gas makes a single pass

through the experiment and then is routed to a capsule exhaust system hold tank and thence to the stack. An emergency cooling source is also available whereby helium at a higher pressure can be introduced into the capsule to effect faster temperature reductions if necessary.

About 0830, 7/8/62 an operator assigned to this experiment noted that there was little or no nitrogen or helium flow into the capsule. However, the capsule temperatures did not start increasing until about 1400 that afternoon. Adjustments were made in the valving but gas flow could not be re-established and the capsule temperatures started increasing. The following shift continued to investigate problems as the temperatures were nearing the alarm limits. During the manipulation of valves to pinpoint the area of flow stoppage the second and third floor continuous air monitor started increasing and, at 1638, the containment vessel was evacuated. Six of the seven operators in building at time of evacuation were contaminated to a maximum of 5000 c/m on their skin and clothing. Two of the operators had positive nasal smears of 2000 c/m.

Two operators re-entered the containment vessel in fresh air equipment and S.W.P. clothing at 1710 to reduce temperatures on the capsule by means of emergency cooling. The temperatures were reduced from 1530° F. At this time it was also noted that the stack gas and particulate activity started dropping. The operators at this time were unable to determine where in the system the flow blockage was located or the source of the sudden gas release to the building. During the remainder of shift the gas release and gas flow problems were investigated and about 2330 that evening the problem of gas flow blockage was found to be in the capsule exhaust holdup system. The gases that normally pass through the capsule to the exhaust holdup system and thence to stack were not getting out of the hold-up tanks. Increasing the gas pressure to the capsule resulted in a corresponding increase in the exhaust hold-up tanks. The normally open solenoid valve between the stack and hold-up system appear to be defective and only partially opening. At 1030 the following morning the reactor power was reduced to 50 KW to permit entry into the first floor equipment space to open a bypass valve around the defective solenoid valve. The tank pressure in the exhaust system dropped from 40 psi to atmospheric pressure. Gas flow was then successfully established through the capsule. The pressurized gas in the hold-up system apparently gained entry into the containment vessel either by a leak in this system or in the capsule gas system, but only under conditions of abnormally high pressure. The reactor power was returned to power at 1400 and the capsule reverted to normal operation.

A fixed flow air sampler placed inside the containment vessel indicated a maximum measurable air activity of 9.3×10^{-7} uc/cc at 1825. The half-life of the containment measured 22 minutes. The floors in the containment vessel smeared a maximum of 3000 c/m at 2300 on 7/8.

The reactor stack gas activity increased from a normal background of 4 to a maximum of 24 on a scale set to trip at 80.

The six contaminated operators were successfully decontaminated and the short half-life of the contaminant permitted release of personnel clothing within a few hours. Bioassay samples were taken from the two operators with positive nasal smears. The results of the bioassay samples were negative.

The containment vessel was on fresh air status from 1710, 7/8 to 1915, 7/8; assault mask status from 1915, 7/8 to 0130, 7/9; off mask status until 0730, 7/9 at which time building went back on assault mask status until 0390, 7/9. Building off masks entirely and floors back to normal at 0930, 7/9.

During the next reactor outage the flow blockage in the capsule exhaust hold-up system will be removed and the system returned to normal.

Yours very truly,

George White
General Manager

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cc: Region V, Division of Compliance, USAEC