NOV 2 1982

MEMORANDUM FOR: Darrell G. Eisenhut, NRR
Edward L. Jordan, IE
Richard E. Cunningham, NMSS
Robert M. Bernero, RES
Clemens J. Heltemes, Jr., AEOD
Joseph Scinto, ELD

FROM: Victor Stello, Jr., Chairman
Committee to Review Generic Requirements

SUBJECT: TRANSMITTAL OF PRESENTATION MATERIALS FOR CRGR MEETING #24

Enclosed is a draft copy of the proposed IE bulletin titled Overexposures in PWR Cavities that R. Baer (IE) will present for CRGR review at CRGR Meeting #24 scheduled for Wednesday, November 3, 1982. Previously, IE proposed to issue a circular concerning this matter. IE now believes that a bulletin would be more appropriate. IE indicates that (1) there are no substantive changes in requirements (recommended actions were changed to actions) and (2) no response is required by the bulletin.

Original signed by
Victor Stello

Victor Stello, Jr., Chairman
Committee to Review Generic Requirements



Enclosure: IE Bulletin

cc w/o encl:
Commission (5)
EDO
Office Directors
Regional Administrators
G. Cunningham

DISTRIBUTION:

| | |
|---|---|
| VStello | CCameron |
| TEMurley | WLittle |
| DEDROGR Staff | JGagliardo |
| DEDROGR cf | JZwetzig |
| Central File | PDR (NRC/CRGR) |
| SStern | |
| BBrach | |
| RErickson | |
| FHebdon | |

R-001

| OFFICE | DEDROGR/S | DEDROGR/D | DEDROGR | | | | |
|---|---|---|---|---|---|---|---|
| SURNAME | WSchwink:bg | TEMurley | VStello | | | | |
| DATE | 11/1/82 | 11/ /82 | 11/ /82 | | | | |

SSINS NO.: 6830
IEB 82-

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D. C. 20555

October , 1982

IE BULLETIN NO. 82- : OVEREXPOSURES IN PWR REACTOR CAVITIES

Addressees:

All PWR licensees with an operating license (OL) or construction permit (CP) for action. To all licensees or CP holders of other power reactors for information.

Purpose:

To inform licensees of nuclear power reactors with an OL or CP of events with potentially significant impact on the health and safety of workers and to request actions of PWR licensees. No written response to this bulletin is required.

Description of Circumstances:

On March 25, 1982 an overexposure occurred at Commonwealth Edison's Zion 1 facility when a Shift Engineer entered an unmonitored area beneath the reactor vessel (hereafter referred to as the reactor cavity) while the incore instrumentation thimbles were withdrawn. This was the seventh overexposure or near overexposure that has occurred since 1972, under similar circumstances, involving entries into reactor cavities. Zion Unit 1 was in cold shutdown for refueling and maintenance with the incore instrumentation thimbles in the retracted position. The governing maintenance procedure for retracting and inserting incore instrumentation thimbles required that all access doors to the reactor cavity be locked and all incore detectors be in the stored position before the thimbles were retracted. Control of the key to the lock was assigned to the Shift Engineer on duty.

Two entries were made into the reactor cavity to determine the source of water leaking into the reactor cavity while filling the refueling pool. During the second entry, the Shift Engineer received a whole body radiation dose of approximately 5 rems.

There was no job planning for either entry into the cavity high radiation area. No radiation work permit (RWP) was issued for either entry. Since the Shift Engineer was accompanied by a health physics (HP) technician no RWP was required under Zion's RWP procedure. Although radiation surveys were taken to support the second entry, the Shift Engineer entered an unsurveyed area while the HP technician observed his movements. The HP technician mistakenly thought that the radiation source was uniformly distributed along the length of the thimble guide tubes, which run along the entire length of the reactor cavity. Actually the dose rate was substantially higher closer to the reactor vessel end of the tubes.

Discussion:

Since 1972 there have been five other overexposures and one near overexposure associated with individuals entering the reactor cavity (see Table 1). The purpose of most of these entries was to check for water leakage while filling the refueling pool. The major causes of these overexposures were: (1) inadequate preplanning for the entries and a breakdown in communication between the HP and Operations groups, (2) inadequate surveys for the entries, and (3) inadequate training of the HP technicians in the radiological aspects of the incore detection system operation and anticipated dose rates in the cavity. In addition, there are no area radiation monitors in the cavity area to provide a remote readout of dose rates so that workers could check before entering.

In September of 1976, the NRC issued IE Circular No. 76-03 "Radiation Exposures in Reactor Cavities" which described the first three events listed in Table 1 and specified controls to be implemented to prevent their recurrence. Licensees' responses to that circular, including improved training of the staff and establishment of administrative controls, have not been totally effective as indicated by the four subsequent similar incidents. One major concern of the NRC is that the person charged with the responsibility for implementing these controls, the Shift Supervisor, has frequently been the individual overexposed. All four of the exposure incidents that have occurred since the issuance of Circular 76-03 have resulted from Shift Supervisors entering the cavity to check for leaks. The NRC is also very concerned that this recent overexposure was the second such event at Zion. A civil penalty of $100,000 was imposed for this event. NRC considers these overexposures to be unacceptable and intends to apply its full enforcement authority for future occurrences. Escalated enforcement actions, including civil penalities up to the statutory limit, will be considered.

Actions To Be Taken By PWR Facilities:

1. Minimize or eliminate the need for entry into the reactor cavity with thimbles withdrawn. Consider a) requiring thimble reinsertion before entries, b) improved refueling cavity seals, c) use of remote leak detection systems, and/or d)remote reactor cavity inspection systems (such as video equipment).

2. Evaluate the need to provide area radiation monitors in the cavity with a remote readout that can be checked by workers before entry.

3. Review High Radiation Area access control procedures and revise as necessary to prevent inspection/work entries into the reactor cavity until adequate surveys have been performed and a RWP is issued for cavity entry. For reactor cavity areas, RWPs should be an entry requirement, thereby assuring adequate preplanning of work is performed, independent of HP escort/job coverage provided.

4. Upgrade operations and health physics staff training programs to emphasize the specific radiological hazard associated with the reactor cavity during all modes of reactor operation.

It is expected that licensees will increase their HP and operations staff's awareness of the reactor cavity potential hazards and make any necessary procedural changes either prior to the next refueling outage or two months after receipt of this bulletin, whichever is sooner. For the longer term recommended actions (1 & 2) which may involve hardware modification/ requisition, licensees should have completed their evaluations and formulated their positions within 6 months of receipt of this bulletin.

No written response to this bulletin is required. Your review of this matter to determine its applicability to your facility and any corrective and preventive actions taken or planned, as appropriate, will be reviewed during a future inspection. If you desire additional information regarding this matter, contact the Regional Administrator of the appropriate NRC Regional Office or this office.

Richard C. DeYoung, Director
Office of Inspection and Enforcement

Technical Contact: R. Pederson, NRR
(301) 492-7541

J. Wiggington, IE
(301) 492-4967

Attachments:
1. Table 1
2. List of Recently Issued IE Bulletins

Attachment 1
IEB 82-
October , 1982

TABLE 1

Overexposures Associated with
Individuals Entering the Reactor Cavity

| Date | Plant | Dose (rems) |
|---|---|---|
| October 1972 | Point Beach | 5 |
| March 1976 | Zion | 8 |
| April 1976 | Indian Point | 10 |
| May 1978 | Kewaunee | 2.8* |
| April 1979 | Surry 2 | 10 |
| April 1980 | Davis-Besse | 5 |
| March 1982 | Zion | 5 |

*Near overexposure

ENCLOSURE 2

CRGR PACKAGE FOR I&E BULLETIN: OVEREXPOSURES IN PWR CAVITIES

## Proposed Generic Requirement

The action proposed is the issuance of an I&E bulletin to inform nuclear power plant licensees of the circumstances surrounding the recent overexposure at the Zion station. This is the seventh overexposure (or near overexposure) that has occurred under similar circumstances and is the second such overexposure at Zion. The recommended actions in the bulletin are intended to prevent a reoccurrence.

## Supporting Documentation

Attachment 1 contains copies of the PNO on the recent Zion experience, the resulting notice of civil penalty and Commonwealth Edison's response to the civil penalty.

## Licensee Actions

The proposed I&E bulletin requests 4 recommended licensee actions to prevent a reoccurrence of these overexposures. Recommendation number one is intended to prevent a reoccurrence by minimizing (or possibly eliminating) the need for entries into the reactor cavity with the thimbles down. Recommendation number three is intended to strengthen the administrative controls to insure required entries are preceded by proper job planning and radiological surveys. Recommendations 2 and 4 are intended to enhance the workers' awareness of the radiological hazards concerned with entering the reactor cavity.

Recommendations one and two suggest the consideration of installing new equipment. If the licensee determines a need for this equipment, it can be installed during a normal refueling outage as a noncritical path job.

## Reactor Categories

The proposed bulletin is to be issued to all PWR licensees and CP holders for recommended action. It will be issued to BWR licensees and CP holders for information only.

## Cost Assessment

The benefit to be derived from the issuance of the proposed bulletin is the termination of a series of overexposures resulting from inspections of lower reactor cavities in PWRs. These overexposures have averaged slightly less than one per year since 1972. The issuance of this bulletin may prevent a potentially more serious exposure from occurring. Although the highest dose experienced in one of these incidents so far has been about 10 rems, the radiation fields in the cavity with the thimbles down can deliver potentially life-threatening doses.

Implementing the recommended actions of the proposed bulletin would have several relatively minor impacts on PWR licensees. The impacts associated with each recommendation are discussed below.

(1) A review of the methods to eliminate the need to enter the reactor cavity should not require more than one staff-month of effort by an engineer. For those plants that currently do not allow entries into the cavity while the incore thimbles are out of the core, the impact of this recommendation is negligible. For those plants that routinely experience refueling pool leaks and are not allowing cavity entries, several alternatives have been suggested to minimize the impact of this recommendation. The cost of these alternatives ranges from several thousand dollars for requiring reinsertion of the thimbles to a very minimal cost for a leak detection system. Filling the refueling pool is usually a critical path job and requiring reinsertion of the thimbles can add as much as six hours (thereby entending the outage for six hours). On the other hand, the Farley plant has devised a leak detection system which consists of polyethelene bags, fixed below each refueling pool seal, fitted with leak-off tubes that direct any leakage to a central collection point. Selection or non-selection of one of those methods to eliminate cavity entries is left to the licensee.

(2) The evaluation of need for an area radiation monitor in the cavity (including documentation of the evaluation) should not require more than one staff-week of effort by a health physicist. The evaluation of need is left to the licensee to minimize the impact of this recommendation on those licensees that do not frequently make entries into the cavity area.

(3) Requiring all personnel that enter the reactor cavity area for inspection/work to be issued an RWP will cause some licensees (that currently exempt RWP requirements if escorted by HP) to rewrite their procedures. Review, rewrite and approval of the RWP issuance procedure will require one to two staff-weeks per plant. Implementation of the new procedure is another impact on the licensee; however, the added small increment of the number of RWPs issued by this new procedure would be neglible compared to the large number of RWPs issued each year at a plant.

(4) Review and upgrading of HP, and Operations training programs to include training on specific radiological hazards in the reactor cavity should not require more than two staff-weeks of effort by the utility training staff. Integrating the radiation hazards training into the existing training/retraining programs at the plant, minimizes any impact of implementing this recommendation.

Priority

The issuance of this bulletin is a category 1 priority. The purpose of this bulletin is to inform licensees of the circumstances surrounding several violations of the requirements of 10 CFR 20 and to provide recommendations to prevent reoccurrences of those violations. The staff contends these violations of 10 CFR 20 are indicative of unsafe practices currently employed at some licensee facilities. These practices are of a nature that additional (potentially more severe) violations are likely unless preventative action is taken.

Existing Regulations

Section 203(c) (2) of 10 CFR 20 specifies the regulations for entries into high radiation areas. Paragraphs (i) and (ii) of 203(c) (2) specify a 'control device' or 'alarm signal' to control entries into high radiation areas. Paragraph (iii) specifies that entrances to high radiation areas be locked with 'positive control over each individual entry'. Paragraphs (i) and (ii) have very limited applicability to nuclear power plants which operate generally under paragraph (iii). The recommended actions of this proposed bulletin are consistent with the requirements of 10 CFR 20.203. They are designed to minimize or eliminate the number of entries made into a high radiation area (the lower reactor cavity) and provide a greater margin of 'positive' control over those entries that are necessary.

In lieu of the 'control devices' or 'alarm signal' specified in (i) and (ii) of 20.203(c) (2), section 6.12 of the Standardized Technical Specification (STS) provides further guidance to control access to high and very high radiation areas. Section 6.12 of the STS specifies the issuance of a Radiation Work Permit (RWP) for entries into these areas. Since surveys of the radiological hazards in the area are required prior to an RWP being issued section 6.12 of the STS provides an exemption of HP personnel from RWP issuance requirements to allow them to make these surveys. Additionally, the STS provides an exemption of personnel escorted by HP personnel from RWP issuance requirements since it is assumed that RWP-type requirements will be enforced by the continuously present HP. The NRC staff recognizes the need for these specific exemptions for many routine situations. This bulletin informs licensees that the specific exemption for HP escorted personnel should not be used for reactor cavity entries when the incore thimbles are out of the core and very-high radiation levels exist.

Methods of Implementation

The action proposed here is to issue an I&E bulletin to all LWR Licensees. No response is required by the licensee. Review of corrective actions taken by each PWR licensee is to be evaluated during later routine regional inspections.

Justification for Time-Frame of Requested Actions:

The time-frames for requested actions are divided into two phases: short-term actions for administrative and training changes, and longer-term actions for evaluations and possible hardware modifications.

The time-frame for short-term actions is prior to the next refueling outage or two months after receipt of the bulletin, whichever is sooner. Plant refueling outages are the times all previous overexposures have occurred and are the times when personnel entry into reactor cavities are most likely to occur. Personnel should be alerted to the significant radiological hazards of entry into reactor cavities prior to this period. Also, RWP procedure changes, if required, should assure appropriate evaluation prior to personnel entry into reactor cavities. The two months leeway allowed plants not entering refueling outages represents the staff's judgment as sufficient period to accomplish the requested actions without undue effort or burden on the licensee's staff, since they already have established training programs (safety meetings, refresher sessions, etc.) and RWP procedures.

The time-frame for longer-term actions is within 6 months of receipt of the bulletin. This time-frame allows for adequate evaluation of the several options presented. Since equipment procurement and installation may be involved, the requested actions are only for completion of evaluations and formulation of future actions.

Attachment: PNO, CP

PRELIMINARY NOTIFICATION OF EVENT OR UNUSUAL OCCURRENCE--PNO-III-82-32 Date: March 29, 1982

This preliminary notification constitutes EARLY notice of events of POSSIBLE safety or public interest significance. The information is as initially received without verification or evaluation, and is basically all that is known by the staff on this date.

Facility: Commonwealth Edison Company
Zion - Unit 1
Docket No. 50-295

Licensee Emergency Classification:
_____Notification of Unusual Event
_____ Alert
_____ Site Area Emergency
_____General Emergency
__X Not Applicable

Subject: EMPLOYEE OVEREXPOSURE

On March 25, 1982, a Shift Engineer made a planned entry into the reactor cavity beneath the Unit 1 reactor vessel in an attempt to locate water leaks which were causing head removal problems. The reactor was shut down and the incore thimbles were withdrawn to the exposed position.

Prior to the Shift Engineer going into the cavity, a Rad/Chem Technician (RCT) made an initial entry, and determined that the exposure rate at the bottom of the ladder into the cavity was 50 rems per hours. Thus, a 30-second staying time was planned for the Shift Engineer with an allowable exposure of 400 mrems. The Shift Engineer descended the ladder and apparently progressed beyond the bottom of the ladder during his 30-second stay.

When called out of the cavity, the Shift Engineer's 0-500 mrem self-reading dosimeter was off-scale. The film badge vendor, on March 26, 1982, reported the Shift Engineer's dose to be 3600 mrems, compared with the RCT's dose of about 200 mrems, for this event. The regulatory limit is 3000 mrems per calendar quarter.

Region III (Chicago) was informed of this incident by the Resident Inspector at 8:00 a.m. (CST) on March 29, 1982. Region III will send a radiation specialist to the site to evaluate the overexposure.

Neither the licensee nor Region III plans to issue a news release. Region III will respond to inquiries.

The State of Illinois will be notified. This information is current as of 11:00 a.m. (CST) March 29, 1982.

Duplicate

CONTACT: D. E. Miller
-384-2634

L. R. Greger
384-2644

DISTRIBUTION:

| | | | | |
|---|---|---|---|---|
| H. St._____ | MNBB ____ | Phillips ____ | E/W_____ | Willste |
| Chairman Palladino | EDO | NRR | IE | NMSS |
| Comm. Gilinsky | AEOD | Landow (OIA) | | RES |
| Comm. Ahearne | PA | | | |
| Comm. Roberts | MPA | Air Rights_____ | | MAIL: |
| ACRS | ELD | SP | INPO ____ | ADM:DMB |
| SLCY | | | NSAC_____ | |
| OA | | | | |

Regions I_____, II_____, IV_____, V_____ Licensee (Corporate Office)_____.

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-295/82-09(DETP)

Docket No. 50-295 License No. DPR-39

Licensee: Commonwealth Edison Company
Post Office Box 767
Chicago, IL 60690

Facility Name: Zion Nuclear Power Station, Unit 1

Inspection Conducted: March 30-31, April 7-8, and 29, 1982

Inspectors: D. E. Miller _____

L. R. Greger _____

Approved By: L. R. Greger, Chief _____
Facilities Radiation
Protection Section

Inspection Summary:

Inspection on March 30-31, April 7-8, and 29, 1982 (Report No. 50-295/82-09 (DETP))
Areas Inspected: Special inspection to review the circumstances surrounding an overexposure received by a licensee employee on March 25, 1982. The inspection involved 48 inspector-hours onsite by two NRC inspectors.
Results: Two apparent items of noncompliance were identified: (1) 10 CFR 20.101 - an individual received a whole body radiation dose in excess of three rems (Paragraph 5.2); (2) 10 CFR 20.201(b) - failure to make an adequate survey and evaluation of radiation levels beneath Unit 1 reactor vessel (Paragraph 7.3)

Attachment 2

## DETAILS

1. Persons Contacted

K. Graesser, Superintendent
E. Fuerst, Assistant Superintendent, Operations
G. Pliml, Assistant Superintendent, Administrative and Support Services
R. Budowle, Unit 1 Operating Engineer
J. Gilmore, Unit 2 Operating Engineer
D. Howard, Rad/Chem Supervisor
F. Ost, Lead Health Physicist
R. Aker, Health Physicist
F. Rescek, Health Physicist, CECo

The inspectors also contacted several other licensee employees including Rad/Chem Foremen, Rad/Chem Engineering Assistants, Rad/Chem Technicians, and members of the technical and engineering staffs.

2. General

This special inspection, which began at 1:30 p.m. on March 30, 1982, was conducted to review the circumstances surrounding an overexposure received by a licensee employee when he entered the Unit 1 reactor cavity on March 25, 1982. The reactor was shut down and the incore thimbles were withdrawn. The dose to the film badge, worn between the waist and chest, was about 3550 mrem. Because of the location of the radiation source, it is likely that a higher dose was received by the individual's lower body. The individual's film badge readings for the first calendar quarter of 1982 total 3880 mrems. Later evaluation by the licensee determined an estimated maximum whole body dose of 4.9 rems for the quarter.

Several problems which contributed to the resulting overexposure were identified. These include inadequate preplanning, inadequate surveys, inadequate training, and shortage of calibrated high range portable survey instruments.

Two items of noncompliance were identified concerning overexposure of a licensee employee and failure to make adequate evaluations of radiation hazards on two occasions.

3. General Plant Conditions and Sequence of Events

Unit 1 was in cold shutdown for refueling and maintenance. Incore instrumentation thimble retraction started during the evening shift on March 23, 1982, and was completed about six hours later at approximately 0400 hours on March 24. Maintenance Procedure RC001-12, "Retracting and Inserting Incore Instrumentation Thimbles," requires that all access doors to the reactor cavity be locked with "R" locks, and all incore detectors be in the storage position before the thimbles are retracted. Control of keys to the "R" locks is administratively assigned to the shift engineer on duty.

Shortly after thimble retraction was completed, the licensee began to flood the refueling cavity in preparation for refueling. At about 1030 hours, it was determined that the water level in the refueling cavity was decreasing. At about noon, a shift foreman briefly entered the cavity beneath the reactor vessel (hereafter call reactor cavity) in an effort to locate the leakage source. The shift foreman saw that the leakage was massive. The licensee decided to lower the water in the refueling cavity, reinstall the reactor vessel head, and investigate the leakage source. At about 2300 hours, the licensee found an excore nuclear instrumentation cover gasket had slipped and was apparently the cause of the leak.

After the gasket was replaced, the licensee raised the vessel head and flooded the refueling cavity to about 130 inches. At about 1800 hours on March 25, a shift engineer entered the reactor cavity to determine if there was further leakage. During this entry, the shift engineer received a radiation dose in excess of regulatory limits. The leakage continued.

The licensee raised the water level to see if increased static water head would seat the gasket and stop the leak. At about 2130 hours, a shift foreman briefly entered the reactor cavity and found there was still leakage. The licensee again lowered the refueling cavity water level.

After further gasket replacement on March 26, the refueling cavity water level was again raised. At about 0600 hours on March 27, it was determined that there was still leakage. There is no record of personnel entry to the reactor cavity at this time. The licensee again lowered the refueling cavity water level. After installing redesigned gaskets on the nozzle flanges, the licensee inserted the incore instrumentation thimbles during the day shift on March 28, and again raised the water level in the refueling cavity. With the thimbles inserted and radiation levels in the reactor cavity greatly reduced, entry under the reactor vessel was made to look for leaks. No significant leakage was identified. The licensee retracted the incore instrumentation thimbles and proceeded with the refueling.

4. Reactor Cavity Entry on March 24, 1982

While flooding the refueling cavity in preparation for refueling, the licensee determined, at about 10:30 a.m. on March 24, that the water level in the refueling cavity was decreasing. The licensee decided that an entry into the reactor cavity would be made in an attempt to locate the source of leakage from the refueling cavity to the reactor cavity.

A shift foreman obtained an administrative dose extension (to 500 mrem for the day) from a plant health physicist, and a digital dosimeter from a rad/chem foreman. He then proceeded to the reactor cavity access area where a rad/chem technician (RCT) trainee was already monitoring the installation of a temporary pump in the cavity.

According to the licensee, entry into the cavity was not made while installing the pump; the pump was lowered by rope. The RCT trainee stated that he had been informed by the rad/chem foreman that a cavity entry would be made. The rad/chem foreman cautioned the trainee to be careful because high radiation levels may be encountered in the reactor cavity. The trainee did not make a radiological survey in the reactor cavity before the shift foreman arrived. Also, there was no discussion between the RCT trainee and the shift foreman concerning radiological conditions in the reactor cavity before the foreman made the reactor cavity entry.

The shift foreman borrowed the RCT trainee's RO-2 portable survey instrument and made an entry into the cavity down to the bottom of the ladder. The shift foreman had the RO-2 on its lowest scale (0-500 mR/hr) during the descent. The shift foreman said that he did not look at the RO-2 meter on the way down. As he neared the bottom of the ladder, he was alerted to increasing radiation levels by the audible indication of the digital dosimeter, and he glanced at the survey meter as he reached the bottom of the ladder. Upon seeing that the meter was off scale, he immediately climbed out of the cavity. At the reactor cavity access area, the shift foreman checked his digital dosimeter, which read 61 mrem, and his self-reading pocket dosimeter, which read 250 mrem. The shift foreman said that the self-reading pocket dosimeter read about 100 mrem before the entry. During the entry, the shift foreman saw that a large leak existed somewhere around the reactor vessel.

After the shift foreman made the entry, the RCT trainee went down the ladder to about Point B (Figure) where his RO-2 meter pegged full scale on the 0-5 R/hr scale. The RCT trainee made another entry with a teletector. He went down the ladder to about Point A (Figure), extended the teletector probe, and read exposure rates of 35 R/hr at Point B and 85 R/hr at Point D. No further reactor cavity entries were made on March 24. The shift foreman's film badge for the period March 15-28 read 250 mrem, which agrees with dose estimates for the period as indicated by self-reading dosimeter.

## 5. Reactor Cavity Entries on March 25, 1982

### 5.1 Description of Events

On March 25, a cover gasket was replaced and plans made to again increase refueling cavity water level. An operating engineer wrote a night order which stated: "With water above the flange, make an entry to the cavity area with RP (radiation protection) and check for leaks as best as possible minimizing exposure."

The rad/chem foreman learned at a shift meeting that a planned entry into the reactor cavity would be made. At about 1800 hours the shift engineer went to the rad/chem office and told the rad/chem foreman that he was preparing to make the entry. The shift engineer then went to a plant health physicist to request

an administrative approval for dose extension to 500 mrem for the day. The shift engineer was wearing a 0-200 mR self-reading dosimeter and a film badge. There was no discussion concerning the need for additional dosimetry.

While the shift engineer was with the health physicist, the rad/chem foreman assigned an RCT to cover the job. The foreman and the RCT recalled discussions about an exposure rate of 85 R/hr from the previous day's entry, conducted on another shift, but they were unable to find the survey record to verify this information. The foreman later assigned an RCT trainee to assist the RCT. When the shift engineer went past the rad/chem foreman while leaving the office, the foreman asked if the incore detectors were "parked." The shift engineer responded "yes." There was no discussion of thimble position.

During discussions with the involved health physicist and rad/chem foreman, the inspectors learned each had assumed that the other had discussed radiological planning for the entry with the shift engineer. They both stated that the shift engineer was more familiar with the area than they were.

In preparation for entry, the RCT attempted to locate a teletector that was calibrated on its top scale. The RCT was not successful in locating a teletector which was calibrated on the highest scale and went to the reactor cavity access area with a teletector and an RO-2A survey meter which were calibrated to 50 R/hr. The RCT and shift engineer were wearing full protective outer clothing with plastic rain suits and full face respirators. The shift engineer was also wearing rubber boots because he expected that there would be water above the cavity platform.

The RCT took the teletector and a flashlight (the cavity was dark) and proceeded down the cavity ladder to make a survey. When he reached Point A (Figure), he read an exposure rate of about 200 mR/hr. He said that this surprised him because he was expecting 85 R/hr. The RCT then extended the teletector probe down and in front of the ladder and read an exposure rate of about 35 R/hr at Point B and about 50 R/hr at Point C (Figure). The RCT then handed the teletector up to the RCT trainee, who was above at the top of the ladder, got the RO-2A from the trainee, went down the ladder to the bottom step, extended his arm to about Point C (3 feet above the platform), and verified the 50 R/hr reading. There were no further surveys taken.

The RCT stated that he then went up the ladder to about Point A, yelled to the RCT trainee to tell him the exposure rate at Point C, and told the shift engineer he could now go down. When the shift engineer arrived at about Point C, the RCT yelled to the trainee to start keeping time. The shift engineer was told the dose rate at Point C (50 R/hr) but was not told his allowed stay time, nor was there any discussion of his intended actions in the reactor cavity.

The RCT trainee calculated the permitted stay time to be 30 seconds (about 400 mrem) to keep the shift engineer within his dose extension of 500 mrem.

The shift engineer descended the ladder to the platform, which was covered with about six inches of water. The shift engineer then waded in toward the bottom of the reactor vessel. The shift engineer estimates he went at most eight feet along the platform.

When the trainee yelled that 30 seconds was up, the RCT yelled to the shift engineer to come out. When the shift engineer failed to show up in a few seconds, the RCT yelled again and went further down the ladder. The RCT saw the shift engineer wading back toward the ladder. The RCT and shift engineer then climbed out of the cavity. The trainee stopped the stopwatch at 67 seconds when he could see the shift engineer on the ladder.

The RCT returned to the rad/chem office and told the lead health physicist and the rad/chem foreman that the shift engineer received an estimated dose of 900 mrem. The RCT based the estimated dose on 67 seconds in a 50 R/hr field. The lead health physicist took the shift engineer's film badge and told him not to enter the controlled area until the dose had been evaluated. The film was sent to the vendor on March 26. The results of film badge processing are reported below in Section 5.2.

When interviewed by the inspectors, the RCT said that he did not expect the exposure rate to increase as the shift engineer approached the reactor vessel. The RCT was not knowledgeable about the source of radiation in the reactor cavity or the anticipated radiation levels.

When interviewed by the inspectors, the shift engineer said that he was aware that the exposure rate would increase as he approached the bottom of the reactor vessel. He also said that when he decided to leave the ladder and walk toward the bottom of the reactor vessel to look for the source of leakage, he tried to hurry. He said it was difficult to hurry because the water was about six inches above the platform and his rubber shoe covers were only about eight inches high.

After the shift engineer's entry into the reactor cavity, the licensee raised the water level in the refueling cavity to see if increased static head would seat the gaskets. At about 2130 hours, the same RCT and RCT trainee monitored for a cavity entry made by the shift foreman. The shift foreman made a brief entry to about Point B and saw that there was still significant leakage. This entry appears uneventful.

According to the licensee, no further entries into the reactor cavity were made with the incore instrumentation thimbles withdrawn.

5.2 Personal Overexposure

On March 26, the film badges of those participating in the March 25 reactor cavity entries were sent to the vendor for processing. The following day the vendor phoned the licensee and reported that the shift engineer's film badge reading was 3700 mrem. At the request of the licensee, the vendor read the film two more times. The reading was verified.

During the film badge period March 15-26, the shift engineer had a self-reading dosimeter dose indication of about 150 ~~mR~~ mrem before the cavity entry. Subtracting this previous dose, the dose received to the film badge during the entry was about 3550 mrem. The shift engineer had previous film badge readings totaling 180 mrem for the calendar quarter. Adding the 3700 mrem gives a total personal dose of 3880 mrem for the first calendar quarter of 1982 as recorded by the film badge.

During the reactor cavity entry, the shift engineer was wearing his film badge in the breast pocket of a one piece pull-on protective clothing overall. The shift engineer said that he wears oversized coveralls because they are easier to put on and take off. He said that the film badge was located about midway between his chest and waist when the entry was made. Because of the configuration of the reactor cavity and the location of the active portion of the withdrawn thimbles, it is probable that the dose received by the individual's lower trunk was greater than to the film badge. The licensee evaluated the possible dose for the entry and estimates a dose of 4.721 rem. Added to previous doses for the quarter, the individual's total dose is 4.901 rem. The licensee made a timely report, dated April 23, 1982, in accordance with 10 CFR 20.405.

The licensee's evaluation was based on the calculated direct radiation contribution of the exposed portion of the individual incore instrumentation thimbles to the exposure rate at various locations within the reactor cavity. This method of calculation is conservative in this application since it maximizes the variance between exposure rates at the film badge and the lower portion of the whole body. (i.e., The contribution to exposure rates from scattered radiation would have less vertical variability than the direct radiation component.) However, the calculated dose to the shift engineer is also dependent on his assumed movements within the reactor cavity. Minor, and reasonable, variations in the licensee's assumptions can introduce a 10 to 15 percent variation in the licensee's calculated whole body dose.

An independent evaluation by the inspectors, based on the three exposure rate measurements made by the licensee near Point B, resulted in a calculated maximum quarterly whole body dose of

about five rems. Although rigorous calculations of the maximum whole body dose are not possible without the collection of the actual vertical dose profile within the reactor cavity with the incore thimbles withdrawn, it appears reasonable from the film badge results, and the calculations performed by the inspectors and the licensee, that the quarterly whole body dose to the shift engineer was between four and six rems.

The dose received by the licensee employee is contrary to 10 CFR 20.101(b) which permits a dose of three rems per calendar quarter provided certain specified conditions are met. This is an apparent item of noncompliance.

6. Training and Qualifications

6.1 Rad/Chem Technicians (RCT)

The RCT trainee who was assigned to the reactor cavity access area when the shift foreman made his entry on March 24 joined the Rad/Chem Department in December 1981. He had been receiving formal and on-the-job training for about four months. According to the trainee, he has had limited experience in monitoring high radiation fields or performing timekeeping for persons entering high radiation areas. The trainee stated that the rad/chem foreman told him that the radiation levels in the reactor cavity would probably be low but cautioned that the reactor cavity might be a high radiation area and gave him instructions to enter the area cautiously with his survey instrument in front.

The RCT who monitored the shift engineer's entry on March 25 has been at the station since 1974. He worked as a "B" operator from January 1974 to November 1980. In December 1980, he transferred to the Rad/Chem Department and began training. Since that time, about six months were spent in classroom and on-the-job training. The remainder of the time was spent working as an RCT in various jobs. He appears to have had minimal experience in monitoring relatively high exposure rate tasks. He had monitored some filter/demineralizer changeouts. The RCT said that he had been in the reactor cavity once about eight years ago when he was a "B" operator.

The RCT trainee who timekept the shift engineer's entry on March 25 was employed at the Station for about 16 months before transferring to the Rad/Chem Department in November 1981. He attended classroom training for about four months and had been in on-the-job training for about one month.

The RCT and both RCT trainees said that they were not familiar with the specific radiological hazards (radiation source and exposure rate) in the reactor cavity with the instrumentation thimbles withdrawn. They could not recall receiving training, other than general precautions, concerning the area. They

stated they were not given specific instructions concerning the shift engineer's or shift foreman's intended actions in the reactor cavity other than to look for leaks.

During the shifts when the reactor cavity entries were made, there were RCTs on duty who had significantly more experience than those assigned to the cavity entries.

6.2 Health Physicists and Rad/Chem Foremen

The plant health physicists appeared generally knowledgeable concerning the source of radiation in the reactor cavity and the magnitude of expected radiation levels when the instrumentation thimbles are withdrawn. The rad/chem foremen involved in the entries made on March 24 and 25 were not knowledgeable of the specific radiation source and exposure rates in the reactor cavity. They did know that the reactor cavity can be a high radiation area during refueling outages.

6.3 Shift Foreman and Shift Engineer

The shift foreman and shift engineer who made entries into the reactor cavity on March 24 and 25 have had extensive training in radiation protection during reactor operator and senior reactor operator instruction. These individuals also knew the physical layout of the reactor cavity and source of radiation in the cavity when the instrumentation thimbles are withdrawn. These management individuals were the most knowledgeable about the radiological hazards in the reactor cavity of all the people involved in the entries made on March 24 and 25.

6.4 Reactor Cavity Radiation Hazard Training

On March 17, 1976, during preparation for the first refueling, a licensee management individual received an overexposure in the Unit 1 reactor cavity while looking for leaks. The exposure rates were significantly less in the reactor cavity at that time because the withdrawn instrumentation thimbles had much less activation.

After the overexposure, the licensee instructed station personnel about the incident, the cause, and the radiological hazards. This specific instruction, however, was not included in the ongoing training for operations and rad/chem personnel. During recent RCT training, the reactor cavity radiological hazard was described only in general terms, with no specific description of the radiation sources or the expected rapid exposure rate increase as the reactor vessel is approached when the instrumentation thimbles are withdrawn. Of the individuals directly involved in the March 24 and 25 entries to the reactor cavity, the shift engineer, the shift foreman, and the RCT foremen were onsite in 1976.

## 7. Radiological Evaluations, Preplanning and Surveys

### 7.1 Preplanning

Although the shift foreman who made the March 24 reactor cavity entry obtained an administrative dose extension from a health physicist and a digital dosimeter from the rad/chem foreman, there were no detailed discussions between these individuals concerning the planned entry or the radiological conditions in the reactor cavity. The RCT trainee assigned to the entry was informed by the rad/chem foreman that there was a possibility of high radiation levels within the reactor cavity and to use caution upon entry, but no detailed discussion of radiological conditions or the shift foreman's plans took place. The RCT trainee was unaware of the radiological conditions within the reactor cavity and did not discuss these conditions with the shift foreman before the shift foreman entered the reactor cavity alone, with the RCT's RO-2 survey meter. No reason was given for the assignment of an RCT trainee to the entry other than that he was already in the general area covering another job.

On March 25 the rad/chem foreman was told at a shift meeting that an entry into the reactor cavity would be made. The foreman assigned an RCT to cover the job and the shift engineer obtained an administrative dose extension from a health physicist. There were no detailed discussions between these individuals concerning the planned entry or the radiological conditions in the reactor cavity. The health physicist stated he assumed the rad/chem foreman would handle the details of the entry with the shift engineer. The rad/chem foreman stated he assumed the health physicist would do so.

The only dosimetry worn by the shift engineer was his normal film badge and 0-200 mR self-reading dosimeter. There were no discussions concerning what the shift engineer planned to do other than look for leaks. The RCTs who were in attendance when the entry was made did not know that the shift engineer would leave the ladder and approach the reactor vessel. Nor were the RCTs cognizant of the specific radiological conditions in the reactor cavity other than an undocumented report of radiation levels of 85 R/hr from the previous day. The location of this exposure rate was not known; the RCT who entered the reactor cavity on March 25 stated that he thought the 85 R/hr measurement had been made at the midpoint of the ladder into the reactor cavity (above Point A) and when he measured 200 mR/hr at this point he assumed that the incore instrumentation had been returned to a shielded position.

The RCTs assigned to the reactor cavity entries on both March 24 and March 25 did not have survey instruments which were calibrated for the exposure rates which existed in the reactor cavity. On

March 25 the RCT attempted to locate a survey instrument calibrated to greater than 50 R/hr but was unsuccessful. According to licensee personnel, three such instruments were onsite, however, only one could be located in a search conducted the following day.

7.2 Surveys

There were no surveys performed in the reactor cavity between the time the instrumentation thimbles were withdrawn early on March 24 and the shift foreman entered at about noon on March 24. The shift foreman entered the cavity with an RO-2 survey instrument set on its lower scale (0-500 mR/hr). Hearing the audible indication on his digital dosimeter increase as he descended the ladder, when he got to the platform he looked at the survey meter and saw it off scale. The shift foreman was in an approximate 50 R/hr field at the time. He immediately climbed out of the reactor cavity without determining the actual dose rate. The RO-2 used by the shift foreman during the entry had an upper range of 5 R/hr and therefore was not adequate to measure exposure rates below Point A. The shift foreman did not monitor the exposure rates during his ladder descent, thereby entering an unsurveyed area. The inspectors were not able to determine what actions the shift foreman would have taken had he not been wearing an audible dosimeter. The subsequent surveys made by the RCT trainee on March 24 were acceptable except for the use of an uncalibrated survey instrument for the final survey. However, the results of this final survey were not used to control an entry as the decision was made not to enter the reactor cavity again on March 24 since the exposure rates were considered too high. The March 24 survey results were not documented for future use, thereby contributing to the lack of planning the next day.

On March 25, an exposure rate of slightly under 50 R/hr was measured near the base of the ladder to the reactor cavity by the RCT using an RO-2A survey instrument with an upper range of 50 R/hr. The shift engineer was informed of this exposure rate before he descended past Point A. No further surveys were made. The RCT stated that he felt the exposure rates would remain relatively constant (50 R/hr) in the reactor cavity because he thought the radiation source was fairly uniformly distributed along the length of the incore tubes, which ran along the entire length of the reactor cavity. He also stated that although he had not discussed the shift engineer's planned actions, he assumed the shift engineer was going to stay close to the base of the ladder. The shift engineer stated that he was aware the exposure rates would increase significantly as he approached the reactor vessel and the withdrawn incore thimbles, but did not think about the exposure rates when he left the base of the ladder and walked six to eight feet towards the reactor vessel. The RCT observed the shift engineer walk towards the reactor vessel into an unsurveyed area but did not attempt to stop him. The timekeeping was based on an exposure rate of 50 R/hr.

7.3 Noncompliance

The entries made by the shift foreman and shift engineer were contrary to 10 CFR 20.201(b) which requires that each licensee make or cause to be made such evaluations of radiation hazards as (1) may be necessary for the licensee to comply with 10 CFR 20 regulations, and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present. This is an apparent item of noncompliance.

8. Enforcement Conference

An enforcement conference was held on April 27, 1982, to discuss the overexposure, Region III's concerns about problems contributing to the overexposure, and the items of noncompliance. The meeting, held at the Region III Office, was attended by Mr. J. G. Keppler, Regional Administrator, NRC, Region III and Mr. C. Reed, Vice President, Nuclear Operations, Commonwealth Edison Company, and members of their staffs.

Region III representatives began the meeting by describing the NRC findings regarding the overexposure including; a summary of events, specific problems identified, and potential noncompliances. There was no significant disagreement concerning the summary of events.

The specific problems discussed included (1) lack of adequate planning and preparations for the March 24 and 25 reactor cavity entries, (2) inadequate radiation surveys associated with the entries, (3) use of inexperienced RCTs to monitor the entries, (4) lack of understanding by radiation protection personnel of the reactor cavity radiological hazards including the radiation sources, (5) inadequate training in reactor cavity radiological hazards even though a similar overexposure had occurred in 1976, (6) failure of shift operations personnel in leadership positions to exhibit good radiation protection practices, and (7) unavailability of survey instruments calibrated to greater than 50 R/hr.

The licensee representatives acknowledged that they were also concerned with the events leading to the overexposure, especially the lack of judgement exhibited by the shift engineer when he left the base of the ladder and proceeded into an unsurveyed area. Specific corrective actions were discussed by the licensee representatives. The specific corrective actions are described in Reportable Occurrence Report No. 50-295/82-14. Also discussed were improvements made in the licensee's radiation protection program since the Health Physics Appraisal in early 1980. Licensee representatives stated that efforts are continuing at the plant and corporate level to improve the performance of the CECo radiation protection programs.

Region III representatives acknowledged that improvements had been made in the licensee's radiation protection program in the last two years, but that it was apparent from the March 24 and 25 reactor

cavity entries that additional improvements are needed. Region III observations concerning methods for improving the performance of radiation protection personnel were discussed, including a graded RCT qualification program, technician specialization, professional health physicist involvement, and management support. The licensee representatives were asked to consider the Region's observations and to meet with regional representatives again in the near future to explore possible solutions to those problems.

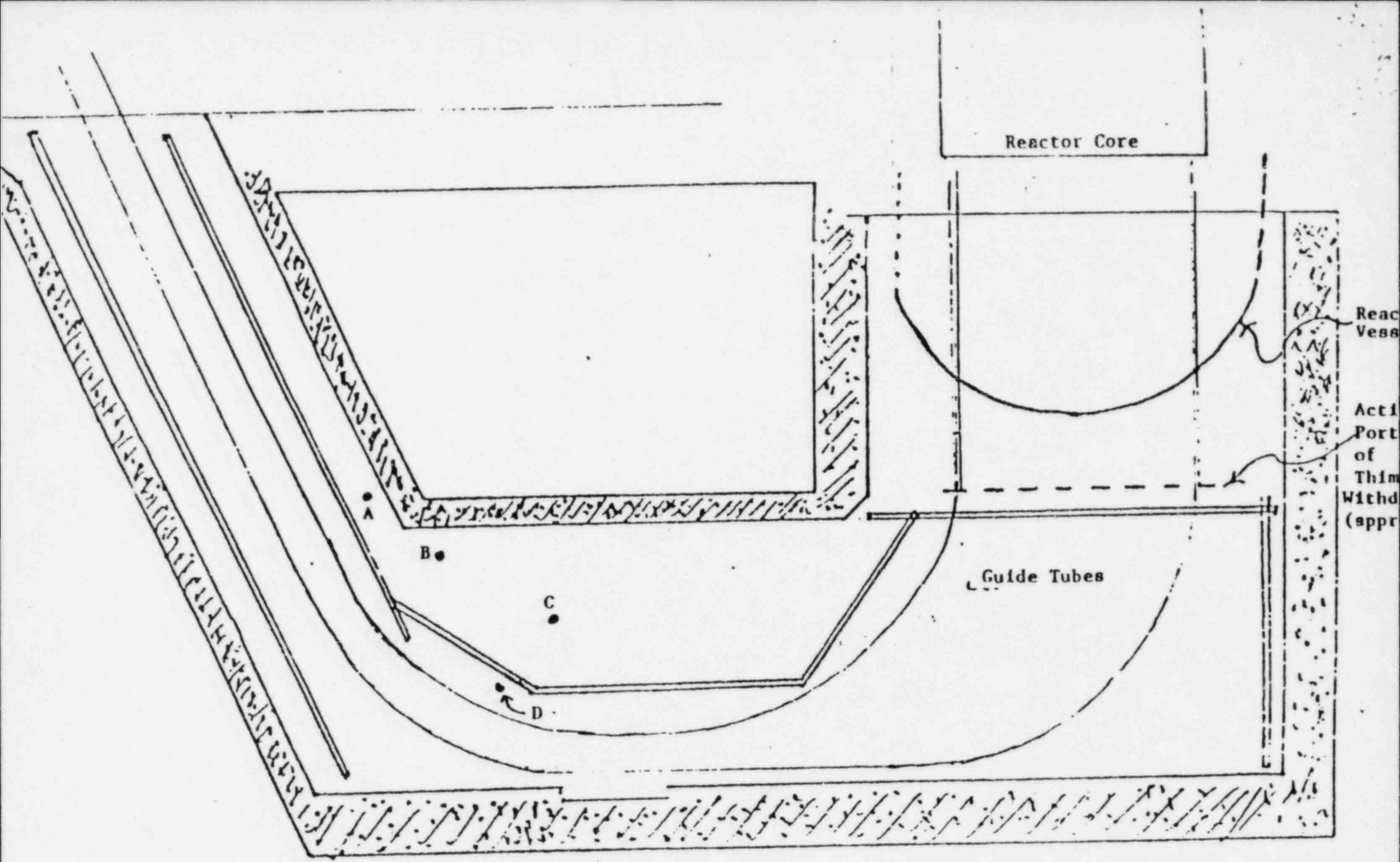
In Attendance at the Enforcement Meeting were:

U.S. Nuclear Regulatory Commission

J. Keppler, Regional Administrator
L. Greger, Chief, Facilities Radiation Protection Section
D. Hayes, Chief, Reactor Projects Section 1B
R. Knop, Chief, Projects Branch 1
D. Miller, Radiation Specialist
C. Norelius, Director, Division of Engineering and Technical Programs
G. Roy, Acting Chief, Technical Inspection Branch
W. Schultz, Enforcement Coordinator
R. Warnick, Director, Enforcement and Investigation Staff

Commonwealth Edison Company

C. Reed, Vice President, Nuclear Operations
L. DelGeorge, Director of Nuclear Licensing
J. Golden, Supervisor, Technical Services, Health Physics and Emergency Planning
K. Graesser, Superintendent, Zion Station
D. Howard, Rad/Chem Supervisor, Zion Station
F. Palmer, Division Vice President, Nuclear Stations
R. Pavlick, Health Physics Supervisor, Technical Services Nuclear
G. Pliml, Assistant Superintendent, Administrative and Support Services, Zion Station
F. Rescek, Health Physicist, Technical Services Nuclear
G. Wagner, Manager, Technical Services, Nuclear Stations




Measured Exposure Rates

A = 200 mrem
B = 35000 mrem
C = 50000 mrem
D = 85000 mrem

Reactor Cavity
Figure

10'

Roscoe.

July 2, 1982
EN 82-22

OFFICE OF INSPECTION AND ENFORCEMENT
NOTIFICATION OF SIGNIFICANT ENFORCEMENT ACTION

Licensee: Commonwealth Edison Company
Zion Nuclear Power Station Unit 1
Docket No. 50-295

Subject: PROPOSED IMPOSITION OF CIVIL PENALTIES - $100,000

This is to inform the Commission that a Notice of Violation and a Notice of Proposed Imposition of Civil Penalties in the amount of One Hundred Thousand Dollars ($100,000) will be issued to the Commonwealth Edison Company on or about July 8, 1982. This action is based on the failure to make an adequate evaluation of radiation hazards before entry into an area beneath the reactor vessel (PWR), a high radiation area, which resulted in an employee receiving a whole body radiation dose of approximately 5 rems which is in excess of the 10 CFR 20 quarterly limits. This is a recurring problem and has been the subject of an IE Circular.

It should be noted that the licensee has not been specifically informed of the enforcement action. The Regional Administrator has been authorized by the Director of Inspection and Enforcement to sign this action. The schedule of issuance and notification is:

| | |
|---|---|
| Mailing of Notice | July 8, 1982 |
| Telephone Notification of Licensee | July 8, 1982 |

A news release will be issued about the time the licensee receives the Notice. The State of Illinois will be notified.

The licensee has 30 days from the date of the Notice in which to respond. Following NRC Staff evaluation of the response, the civil penalties may be remitted, mitigated or imposed by Order.

Contact: E. Flack, IE 24900 J. Lieberman, IE 24909

Distribution:

H St. 4:40
Chairman Palladino
Comm. Gilinsky
Comm. Ahearne
Comm. Roberts
Comm. Asselstine
ACRS
SECY
CA
PE.

MNBB: 5:00
EDO
DED/ROGR
ELD
PA

Air Rights 4:14
SP
RM

Phillips 4:10
NRR

EW
IE
OIA
AEOD

Willste 4:12
NMSS
RES

Regional Offices
RI 4:45 RIV 4:20
RII 4:47 RV 4:25
RIII 4:18

MAIL
ADM: Doc. Mgt. Br.

PRELIMINARY INFORMATION - NOT FOR PUBLIC DISCLOSURE UNTIL JULY 8, 1982

**Commonwealth Edison**
Northern Division
Northwest Area Headquarters
201 N. Arthur Avenue
Mt. Prospect, Illinois 60056

EA 82-78
Rec'd 8/11/

August 9, 1982

Roger -
Zion payed the $100,000 Civil Penalty and submitted the attached response.
Ed Jordan

Mr. Richard C. DeYoung, Director
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Zion Station Unit 1
Response to I.E.
Inspection Report No.
50-295/82-09
NRC Docket No. 50-295

Reference (a): July 9, 1982, letter from
J. G. Keppler to J. J. O'Connor.

Dear Mr. DeYoung:

Reference (a) contained the results of a special inspection conducted by Messrs. D. E. Miller and L. R. Greger of the NRC's Region III office on March 30-31, April 7-8, and 29, 1982, of activities at the Zion Station. The special inspection was conducted to review the circumstances surrounding the overexpsoure received by a worker during an entry beneath the Unit 1 reactor vessel on March 25, 1982. During that inspection, certain activities appeared to be in noncompliance with NRC requirements. The Attachment to this letter provides Commonwealth Edison's response to the Notice of Violation.

To the best of my knowledge and belief the statements contained in the attachment are true and correct. In some respects these statements are not based on my personal knowledge but upon information furnished by other Commonwealth Edison employees. Such information has been reviewed in accordance with Company practice and I believe it to be reliable.

Please address questions regarding this matter to this office.

Very truly yours,

Byron Lee, Jr.
Executive Vice-President

lm

cc: J. G. Keppler
NRC Region III

Dupe of [illegible]

SUBSCRIBED and SWORN to
before me this 9th day
of August, 1982

Notary Public

4697N

ATTACHMENT

COMMONWEALTH EDISON COMPANY

ZION STATION UNIT 1

RESPONSE TO NOTICE OF VIOLATION

1. ITEM OF NON-COMPLIANCE

10 CFR 20.201(b) requires that each licensee make or cause to be made such evaluations of radiation hazards as (1) may be necessary for the licensee to comply with the regulations in 10 CFR Part 20, and (2) are reasonable under the circumstances to evaluate the extent of radiation hazards that may be present.

Contrary to the above, the licensee failed to make such radiation evaluations as were necessary and reasonable under the circumstances to ensure compliance with 10 CFR 20.101 for entries of individuals into an area beneath the Unit 1 reactor vessel on March 24 and 25, 1982.

Admission or Denial of Alleged Violation

The licensee admits the alleged violation.

Reasons for Violation

The radiation-chemistry technician (RCT) involved in the incident failed to survey certain areas of the reactor cavity below the reactor vessel because he did not expect the individual involved in the overexposure to be in those areas. Exposure rates in the unsurveyed area below the reactor vessel were higher than the upper limit of the instrument used.

Corrective Actions Taken and Results Achieved

1. The person involved in the overexposure was spoken to specifically on the importance of always following the radiation protection standards. All the RCTs were spoken to on the importance of communicating thoroughly with the work crews and rad-chem management before jobs begin. At a station safety meeting personnel were also spoken to on the importance of following all requirements of the station radiation protection standards. This includes notifying the radiation-chemistry department of all jobs for which they expect to receive greater than 50 mrem/day. This notification is now achieved by filling out a required radiation work permit (RWP); the RWP program was instituted July 1, 1982. The importance of abiding by the radiation protection standards is also being stressed in the initial station radiation training program.

2. The importance of bringing to the job instruments of appropriate meter range was also stressed to the RCTs. The rad-chem department has ordered two Eberline ionization detectors with lighted dials that can measure up to 100 R/h, and five more extendable GM detectors (Teletectors) that can measure up to 1000 R/h. They are expected to arrive by November 1, 1982. This would bring the station's current inventory of operable Teletectors to seven.

Corrective Actions To Be Taken To Avoid Further Non-Compliance

At RCT re-training (July 26 - October 15, 1982), the RCTs will be further instructed to talk more with the work crews and rad-chem management in order to better understand jobs. Survey techniques will be further covered. All RCTs, rad-chem foremen, and health physicists will also be taught about the incore system and the special radiation hazards associated with the reactor cavity during refueling.

Date When Full Compliance Will Be Met

Measures have already been taken to ensure that RCTs are aware of the importance of adequately assessing work crew jobs and survey requirements. The RCTs will have their training completed by October 15, 1982. Following this, full compliance will be achieved when the new radiation instruments are obtained. They are expected to arrive by November 1, 1982.

B. ITEM OF NON-COMPLIANCE

10 CFR 20.101(a) limits the whole body radiation dose of any individual in a restricted area to one and one quarter rems per calendar quarter, except as provided by 10 CFR 20.101(b). Paragraph (b) permits a whole body dose of three rems per calendar quarter provided certain specified conditions are met.

Contrary to the above, during the first calendar quarter of 1982, an individual received a whole body dose of approximately five rems. Most of this dose was received while making an entry into the area beneath the Unit 1 reactor vessel on March 25, 1982.

Admission or Denial of Alleged Violation

The licensee admits the alleged violation.

Reasons for Violations

The individual went into an area that had not been previously surveyed for radiation hazards. There was a lack of detailed work planning and briefing of all participants prior to the start of the job. The rad-chem personnel involved lacked a good understanding of how the incore detector equipment worked, and did not realize that very high radiation fields exist around withdrawn incore thimbles

because of neutron activation. In addition, rad-chem personnel were not aware that the incore thimbles were withdrawn, and all personnel involved failed to adequately evaluate the potential for very high exposure rates in the reactor cavity area.

Corrective Actions Taken and Results Achieved

In addition to the corrective actions discussed in Item A above, the following actions have been taken.

1. The main door to the Unit 1 reactor cavity is now locked with a special lock. Previously there was an R-key lock in place, which is the standard method used to control entry into any high radiation area.

2. The administrative procedure covering containment access control has been amended to prohibit entry into the reactor cavity unless all of the following conditions exist:

a. The incore thimbles are fully inserted in the reactor vessel.

b. The incore detectors are taken out-of-service.

c. The incore detectors are in storage or inserted in the reactor vessel.

This will preclude entry into the reactor cavity when high exposure rates are present. Prior to any personnel entry into the reactor cavity area, the rad-chem department must first verify that conditions a, b, and c above are met. A safety person must be stationed at the entrance to the reactor cavity.

3. Mechanical maintenance procedure RC001-12 (Retracting and Inserting Incore Instrumentation Thimbles) has been revised to require a sign-off from the rad-chem department, so that the rad-chem department will know when the status of the incore thimbles changes.

4. In operator training and re-training, special emphasis is being given on the incore instrumentation system and the radiation hazards associated with the reactor cavity during refueling.

5. Management effectiveness of the radiation-chemistry program has been improved by having the rad-chem foremen now report directly to the lead health physicist. During normal working days there is a meeting scheduled with the lead health physicist, a rad-chem foreman, the rad-chem supervisor, and the lead chemist (or their designees), at which time any special concerns for the day are brought up.

6. Radiation protection procedures on self reading dosimeters have been revised to require that a person wear a dosimeter with a range greater than the dose the person is expected to receive for the job, and that the range should be greater than the person's expected dose by at least 20%.

Corrective Action To Be Taken To Avoid Further Non-Compliance

1. The main door to the Unit 2 reactor cavity is now locked with a standard R-lock, but will be fitted with the special lock (already in place on Unit 1) prior to the next Unit 2 refueling outage. Although the reactor cavity blow-out doors are not normally used for personnel access, these doors will also be locked with the special locks during future refueling outages of either unit.

2. A status board showing the positions of the incore detectors and incore thimbles will be maintained in the rad-chem office during refueling outages.

3. In the past, a health physicist has usually attended refueling outage meetings. In the future, a rad-chem foreman will also be scheduled to attend the meetings.

Date When Full Compliance Be Met

Additional procedural controls have already been established to ensure rigid administrative control of entries into the reactor cavity area. The main door to the Unit 1 reactor cavity is now locked with a special lock. The licensee will be in full compliance by the next Unit 2 refueling outage, at which time the reactor cavity door on Unit 2 will be fitted with the special lock.

The July 9, 1982, letter from James G. Keppler to James J. O'Connor transmitting the notice of violation (reference (a)) referred to seven specific weaknesses in the radiation protection program that contributed to the incident. The statement of each alleged weakness and the steps Zion Station has taken or will take to remedy them follows below.

1. Lack of coordination between plant health physicist and rad-chem foremen in planning the entries.

Management effectiveness of the radiation-chemistry program has been improved by having the rad-chem foremen now report directly to the lead health physicist. The rad-chem foremen have been instructed on the importance of discussing jobs involving high levels of radiation with a health physicist. Under the new RWP program instituted July 1, 1982, a health physicist must sign off on jobs for which an individual could receive greater than 100 mrem/day. During normal working days, there is a meeting scheduled with the lead health physicist, a rad-chem foreman, the rad-chem supervisor, and the lead chemist (or their designees), at which time any special concerns for the day are brought up. In the past, a health physicist has usually attended refueling outage meetings. In the future, a rad-chem foreman will also be scheduled to attend the meetings.

2. Inadequate radiation surveys associated with the entries.

All the RCTs were spoken to on the importance of communicating thoroughly with the work crews and with rad-chem management before jobs begin. The importance of bringing to the job instruments of appropriate meter range was also stressed. At RCT re-training (July 26 - October 15, 1982), which new foremen will also attend, proper survey techniques will be further addressed.

3. Use of inexperienced rad-chem technicians to monitor the entries.

Rad-chem foremen will be encouraged to get out into the plant in more instances to aid the RCTs directly in covering jobs, including those tasks for which time-keeping is required. If, due to lack of experience or other reasons, a rad-chem foreman or health physicist has concerns about a particlar RCT's ability to cover a certain job, a more experienced RCT will be assigned to cover the job. At least one ANSI-qualified rad-chem person is assigned to each shift.

4. Lack of understanding by radiation protection personnel of the reactor cavity radiological hazards including the radiation sources.

At RCT re-training (July 26 - October 15, 1982) all RCTs, rad-chem foremen, and health physicists will be taught about the incore instrumentation system and the special radiation hazards associated with the reactor cavity during refueling.

5. Inadequate training in reactor cavity radiological hazards even though a similar overexposure had occurred in 1976.

In addition to our response to item 4 above, in operator training and re-training, special emphasis is being given to the incore instrumentation system and the radiaion hazards associated with the reactor cavity during refueling.

6. Failure of shift operations personnel in leadership positions to exhibit good radiation protection practices.

The person involved in the overexposure was spoken to specifically on the importance of always following the radiation protection standards. In operator training and re-training the importance of following all requirements of the radiation protection standards is being addressed. Under the new RWP program, an RWP is required to be filled out on all jobs for which a person could receive greater than 50 mrem/day.

7. Unavailability of survey instruments calibrated to greater than 50 R/h.

The rad-chem department has ordered two Eberline ionization detectors with lighted dials that can measure up to 100 R/h, and five more extendable GM detectors (Teletectors) that can measure up to 1000 R/h. They are expected to arrive by November 1, 1982. This would bring the station's current inventory of operable Teletectors to seven.

Reference (a) also suggested implementation of engineering controls, such as a camera monitoring system or a leak detection system, to eliminate the need to enter the reactor cavity when incore thimbles or detectors are withdrawn. We feel that such controls are not necessary because improved procedures and better access control now preclude anyone from entering the reactor cavity area when the incore detectors or thimbles are exposed. We have, however, modified the gaskets used on the excore instrumentation cover plates (the source of the leakage) to help minimize the possibility of future refueling cavity leaks.

4697N