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

REGION III

Reports No. 50-295/80-05; 50-304/80-04

Docket Nos. 50-295; 50-304 Licenses No. DPR-39; DPR-48

Licensee: Commonwealth Edison Company
P. O. Box 767
Chicago, IL 60690

Facility Name: Zion Units 1 and 2

Inspection At: Zion Site, Zion, IL

Inspection Conducted: March 10-21, 1980

Inspectors: for W. L. Fisher M. C. Schumacher 6/23/80

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Fuel Facility Projects and
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Inspection Summary

Health Physics Appraisal on March 10-21, 1980 (Reports No. 50-254/80-05 and 50-265/80-04)

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Areas Inspected: Special, announced, appraisal of the health physics program, including management, training and qualification, procedures, ALARA, exposure control, access control, surveillance, instrumentation, facilities and equipment, radioactive waste, and accident/recovery capabilities. The inspection involved approximately 600 hours onsite by six NRC representatives.

Results: Significant weaknesses were identified in the health physics program, particularly in areas reflecting on management and management support (Sections 2, 5, and 6); in addition, significant weaknesses were identified in emergency response (Sections 3, 4, 8, 10, and 12), access control (Section 7), contamination control (Sections 2, 7, 8, and 9), and radwaste control (Section 11). Four apparent items of noncompliance (infractions) were identified: failure to conform to contamination control procedures (Section 8.5); inadequate high radiation area access control (Section 7.5); failure to meet instrument calibration schedule (Section 9.2); and failure to maintain specified emergency supplies (Section 10.6).

DETAILS

1. General

The Zion health physics program was evaluated during a special appraisal made March 10-21, 1980. The appraisal team consisted of three inspectors from the NRC Region III office, one from the NRC Region V office, and two DOE contractor health physicists.

Training to permit unescorted access by team members to the entire plant was obtained the first morning, followed by an orientation tour of a major portion of the plant. Thereafter, the inspectors had free access subject only to the licensee's normal controls for posted and/or locked areas. Throughout the appraisal, the team emphasized direct interaction with workers and direct observation of ongoing work by licensee and contractor personnel. The appraisal extended to evening and midnight shifts and weekends, as well as normal day shifts.

At the time of the inspection, both units were at power. However, the station was still feeling the effect of a difficult four-month double outage, which had ended about a month earlier. Its effect was evident on personnel attitudes, morale, and behavior. However, the significant weaknesses observed in the health physics program did not arise in the stress of the outage. They derived primarily from ineffective management of the radiation protection program and from lack of support for the program by station and perhaps higher management. Among the significant problems noted were emergency response training, access control, contamination control, surveillance, radwaste control, and vandalism. These problems are discussed in the following sections of this report.

In addition to the significant problems listed in Appendix A, the appraisal team found the program also beset with minor weaknesses, discussed throughout the report. The overall effect was a program which might have been unable to function adequately under the stress of an emergency.

Because of these findings further meetings were held between CECo management and Region III management to discuss immediate and longer term corrective actions by the licensee (Section 13). Licensee actions underway appeared responsive to NRC concerns. Region III management indicated that licensee progress on these matters would be followed closely.

2. Organization and Management

2.1 Summary

The most significant findings made by the Appraisal Team were that both management and management support of the radiation protection program are weak. Problems with work quality, attitude, morale, discipline, communications, violation of radiation control standards, absence of an ALARA program, loss of professional staff, and other weaknessess observed can usually be linked to these two basic problems.

## 2.2 Organization

Radiation protection responsibility at Zion is assigned to the Radiation/Chemistry Department, which is headed by the Radiation/Chemistry (R/C) Supervisor. Figure 1. depicts the station organization and the position of the department within it. The R/C Supervisor reports to an assistant superintendent who has responsibility for quality control, communications, technical staff, office functions, and security in addition to radiation/chemistry.

Within the Radiation/Chemistry Department the lead heath physicist, the lead chemist, and three foremen report directly to the R/C Supervisor. Additional health physicists, chemists, and engineering assistants (EA's) report to the group leaders, and the radiation/chemistry technicians (RCT's) report to the foremen.

Daily meetings with the Assistant Superintendents, the Personnel Director, and the Technical Staff Supervisor are held by the Superintendent. The Radiation Protection Manager (R/C Supervisor) is not present. He does attend a prior meeting held by the Assistant Superintendent for Administration and Support Services with his department heads, and radiation protection concerns are made known there. To what extent and with what force these concerns are further pursued in the Superintendent's meeting is not known. However, it is clear that the person representing radiation safety in the highest station council has other significant responsibilities which could easily dilute his advocacy for radiation protection. Moreover, he is not a qualified professional in radiation protection.

The Appraisal Team is convinced that an essential element of an effective radiation safety program is daily, formal contact with top station management and active participation in top level meetings where any radiation work is planned or discussed. In effect, the Appraisal Team believes that the Radiation Protection Manager should report directly to the Superintendent or to a corporate level manager. Past radiation safety problems at Zion have largely resulted from management's failure to effectively embrace the idea that a strong radiation protection program with participation by everyone is a necessary part of nuclear station life. Exclusion of radiation protection management from the Superintendent's meeting suggests that this attitude persists.

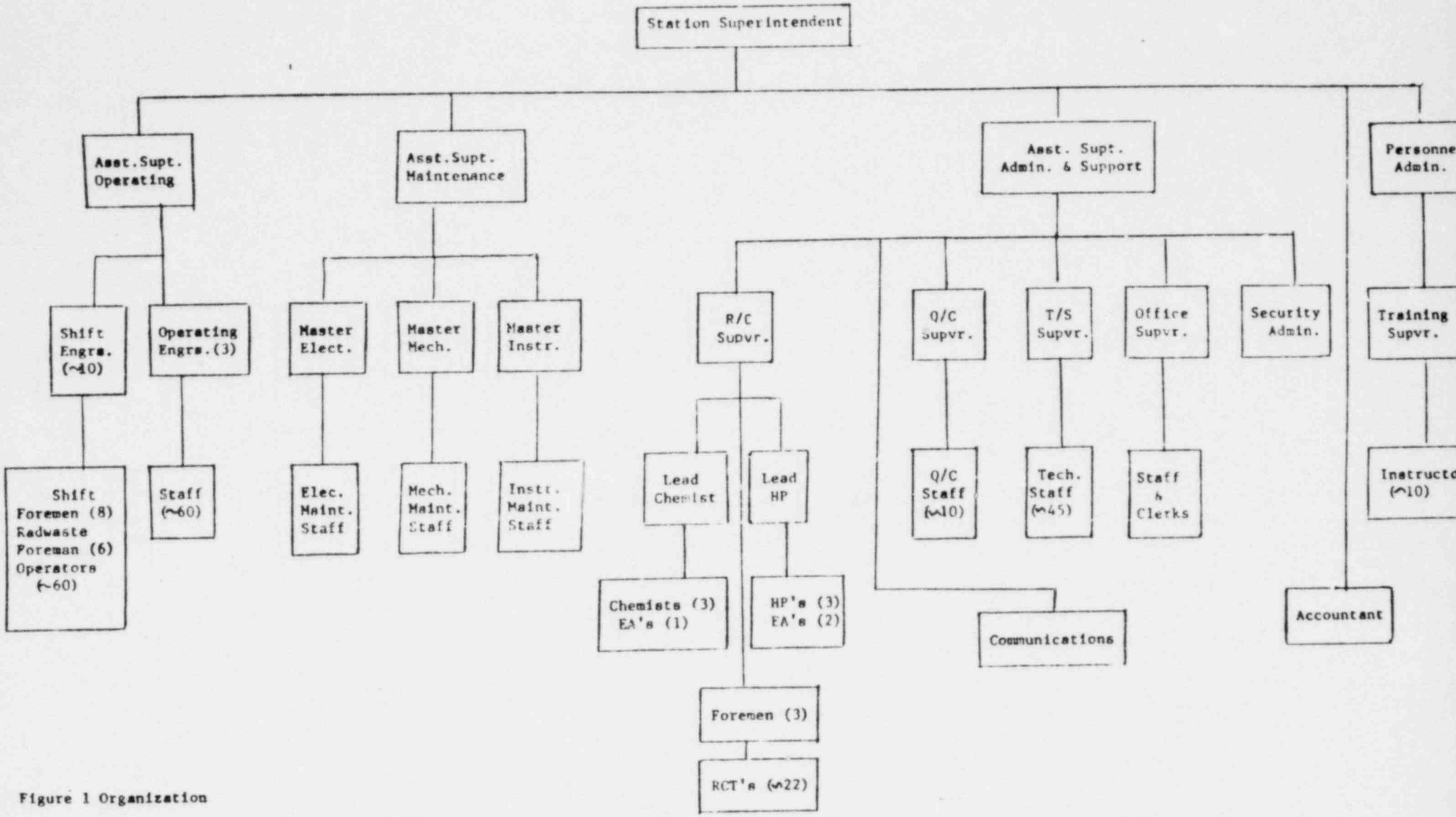


Figure 1 Organization

## 2.3 Management Control and Oversight

Radiation protection program management is weak at all levels within the station. Management controls needed to assure quality of performance (e.g., systematic supervisory performance review and a program for improving performance) are not built in to the system. Job descriptions, personnel performance standards, and personnel appraisals are not being used.

Practical supervisory training appears weak to nonexistent; there appear to be no role models readily available to emulate. A management training program has been instituted; however, the program was too new to have had any demonstrated effect at the time of the inspection. A program of RCT appraisal by foremen was begun in 1979 but not completed.

Although not all foremen were equally effective in their relationships with the RCT's, the most effective supervision appeared to be at this level. However, it was flawed because the foremen are encumbered with clerical and other duties to the extent that their opportunity for observation of work in progress and of plant conditions is neglected.

Health physicists do not routinely supervise or review RCT work. Routine, daily inspections of the entire plant are not made by department supervision. The health physicists, in turn, are not effectively appraised by higher management.

Supervision is not present on the 11:00 p.m. to 7:00 a.m. shift, although two of three RCT's currently assigned are relatively inexperienced and do not meet ANSI N18.1-1971 qualifications for technicians in responsible positions.

The Appraisal Team observed work quality ranging from poor to good. Management recognizes that there are weak and strong performers, but lack of performance standards and evaluations means that weak performers are not improved and that unacceptable performers are not removed.

Personnel problems are evident. Lack of discipline weakens the entire department and morale is very low. Antagonisms exist between various factions: RCT's and HP's, RCT's and foremen, and within the RCT group itself. A number of problems, real or perceived as real, were cited: arrogance of HP's toward RCT's, uncooperative attitude of the union, lack of encouragement for professional development, salary inequities between technicians and professionals, quality and quantity of work done, management weakness, excessive overtime, weak support by station management, and stress accompanying the four-month double outage that ended in January.

A most significant finding of the appraisal was the recurrent acts of vandalism affecting the department, including: destruction of telephones in key locations in containment and the Auxiliary Building; destruction of friskers to the extent they have been withdrawn from routine use on job sites; deliberate contamination of a chromate standard; erasure of computer programs associated with the GeLi system; and fouling of the working environment. Vandalism, regarded most seriously by the Appraisal Team, was discussed at the exit interview and afterward with the Station Superintendent and the corporate Manager of Nuclear Generation. It was also the subject of discussion with company senior management on April 11 and April 28, 1980.

## 2.4 Management Support

Lack of station management support is a major cause of the radiation protection program weaknesses observed. The Appraisal Team believes that symptoms of weak support include: frequent violation of radiation protection standards; poor morale and discipline in the department; persistence of poor working conditions; absence of representation at the superintendent's meeting; ineffective access controls, despite health physics and quality assurance recommendations for improvement; loss of health physics staff; lack of an effective ALARA program (Section 5); and lack of health physics involvement in radiation work planning by other departments. The last two items are most significant because they signal an attitude that radiation protection is really the responsibility and assignment of one department, rather than a pervasive fact of station life.

Observation by the Appraisal Team and discussion with R/C personnel indicate that violations of station standards and procedures are common. For the most part, they involve matters of minor safety significance, but toleration of them casts doubt on the seriousness of management concern and tends to undermine an effective control program.

The company has recently lost or is in the process of losing several experienced (ANSI qualified, or nearly so) health physicists, including one from Zion. Cited reasons for leaving included excessive overtime, lack of encouragement for professional development, salary, and management support. With these losses, the licensee's ability to meet Radiation/Chemistry Supervisor qualifications at all of its stations is jeopardized. If the trend continues, the stations' capability for safe radiation work will be compromised.

Lack of adequate space and poor working conditions impact on the entire department and accentuate the problems with discipline, management, and efficiency. Four health physicists, including the group leader, are housed in a 10' x 11' room suitable for one or, at the most, two people. A visitor talking business with one interrupts all. The foremen work under a similar handicap, and the chemists are not much better off. The problem has existed for some time, although there is adjacent space that could be made available for expansion.

## 2.5 Communications

Information flow within the department and with other departments was described as poor by most people interviewed. Absence of departmental representation from the Superintendent's meeting and lack of an effective personnel appraisal program were noted earlier.

Departmental meetings between RCT's and management have not been a routine practice. The RCT's complain that they get no feedback from the morning meetings and that management keeps them in the dark generally. In January 1980, the lead Health Physicist started having weekly meetings with the RCT's but they were not continued. Frequent meetings should be routinely held and should involve the R/C Supervisor. Communication weaknesses were noted during an earlier inspection when RCT's were found to be unaware of station plans regarding solid radwaste handling improvements.

An important opportunity for two way communication is being missed by not having an RCT log for entering pertinent observations, suggestions, and information that otherwise might be unrecorded, as well as shift turnover information. Such a log should be instituted and be given daily review and appropriate response by foremen and other cognizant management. It should be an important vehicle for flagging problems that need management attention.

A persistent complaint in the department is inadequate advance notice of planned radiation work so that coverage can be planned and adequate ALARA review done. Work usually becomes known when maintenance or contractor personnel show up ready to work. Work requests go to the shift engineer who is supposed to give early notice to the R/C Department of jobs involving them. In practice, a copy of the work usually arrives with the workers or even afterwards. Similarly, advance notice is not obtained for many outage jobs, despite extensive outage preplanning and daily meetings with R/C representation. Unscheduled work and failure of intradepartmental communications were both mentioned as contributory problems. Much greater attention by all concerned is required to effectively achieve ALARA.

## 2.6 Staffing

Total staffing of the Radiation/Chemistry Department (Figure 1) is approximately 38, including a part-time clerk. Total plant staff is approximately 400. The RCT complement has been augmented by as many as 30 technicians from NUMANCO, Inc. during outages. Following the most recent outage, about 13 contract technicians were retained to cover anchor bolt inspection. The personnel resources available to the department are, therefore, considerable. However, at certain times and in certain areas, understaffing and other weaknesses exist

RCT staffing appears adequate for normal operating periods. It may be inadequate during outages when some individuals work several weeks of uninterrupted 10 to 12-hour days. However, part of the problem appears to be inefficient use of the RCT group. More use of specialists, splitting of chemistry and health physics functions, better RCT qualification criteria, and better in-plant supervision would both upgrade the program and increase efficiency. The RCT group in general represents a significant resource of talent and experience that is underutilized and underappreciated. Considerable improvement in efficiency would be realized by the use of permanently assigned and appropriately trained clerks for maintaining files and records and performing other clerical functions now done by RCT's, foremen, and other personnel.

Exercise of shift preference by seniority results in backshift manning mostly by RCT's who are not ANSI N18.1-1971 qualified. There is normally no departmental supervision on the midnight shift and weekends. Therefore, these RCT's are regarded as technicians in responsible positions; i.e., ones who must be ANSI qualified. Unless the shifts are restructured, additional foremen are needed to provide offshift and weekend supervision and in-plant supervision on day shift.

Health physics group staffing (four HP's and two EA's) would normally be regarded as adequate. However, problems with weak management direction, inefficient working conditions, recent loss of plant experience by resignation, lack of clerical support, and the impact of TMI related work has had a strong negative impact on this group. Significant improvements are needed to achieve program improvements identified in this report.

Chemistry group staffing appears adequate although relatively inexperienced except for the group leader. This group does not share the outage burden experienced by the rest of the department. Health physics training would be beneficial for this group and would provide an additional source of manpower for covering outages.

## 2.7 Audit Program

Radiation/Chemistry Department internal audits and those done by the Station Quality Assurance Group and others were reviewed to determine the adequacy and effectiveness of the audit program. It was concluded, by both onsite and offsite corporate personnel, that the audit program does not provide an independent in-depth technical review of the radiation protection program. Departmental internal audit is generally limited to foremen review of RCT survey results and chemist and foremen review of laboratory data. Personnel performance is not audited.

It was concluded that the formal quality assurance audit program conducted by the Quality Assurance Group is useful and well done within the technical limitations of the personnel performing the quality assurance audits. The corporate quality assurance audits also involve primarily a minimum quality assurance review as opposed to an in-depth appraisal of the health physics program. The formal quality assurance programs do not substitute for a good internal audit or for an independent technical appraisal. However, findings from these programs could receive greater attention from station management as well as Radiation Chemistry Department management.

The Audit Report QA-22-79-30, dated September 1, 1979, on the Radiation Protection Filing System Index, revealed lack of attention on the part of management in reviewing the value of records being kept and identifying records that should be kept, such as occupational dose records (see further comments in Section 6.5).

A QA Audit Surveillance Report QAO-S-22-79-34, dated August 1, 1979, on the Radiation Occurrence Report File noted potential problems with failure to follow procedures like the return of respiratory protective equipment. This finding indicated that, at that time, there were nine violations with several repeaters. It was suggested to management in this report that a significant problem could develop during the upcoming outage if greater attention was not given to procedure violations. The latest occurrence record file indicates a total of 29 violations of failure to return respiratory protection equipment at the end of 1979, an increase of 20 over the number found at the time of the audit report.

A QA Audit Surveillance Report QAO-S-22-79-28, dated July 2, 1979, noted difficulty locating material and equipment in the emergency trailer and the emergency room at Victory Memorial Hospital. During this health physics appraisal similar problems were noted. (See Section 10.6).

Two other QA audits were performed in the area of radiation protection. These were reported in QA-22-79-28, dated September 4, 1979. They included failure to follow procedures of collecting a urine sample after a positive nasal smear and failure to obtain a hire-in whole-body count within two badge periods. Both of the procedures were changed to reflect current practices. It would appear that the previous procedures may have been more appropriate for the generation of valuable occupational exposure data. (See Section 6.3).

It was concluded that the radiation protection program suffers from a lack of minimum performance standards or performance criteria upon which both quality assurance and internal audits can be performed, and that the program is suffering from the absence of any management review on the part of Rad/Chem management of the overall radiation protection program. The establishment of performance requirements and the lack of quality is dealt with in many other sections of this report.

## 3. Qualification and Training

### 3.1 Summary

No one in the present Radiation/Chemistry (R/C) Department appears to meet the experience requirements (5 year applied radiation protection) of ANSI N18.1 for Radiation Protection Manager. Approximately half of the Radiation/Chemistry Technicians (RCT's) meet the prescribed requirements for technicians in responsible positions.

Basic radiation protection training for plant personnel and contractors is of good quality. Retraining for RCT's is significantly improved; however, training in specialized topics, such as whole body counting, dosimetry, instrument use and interpretation, calibrations, and emergency response, appears weak. Practical supervisory training for management personnel (foremen, chemists, HP's) has been neglected.

The current status of training for RCT's in the performance of newly (January 1980) developed emergency procedures is regarded as unsatisfactory.

### 3.2 Qualifications

The qualifications of members of the radiation protection and chemistry staff were compared with a strict interpretation of Regulatory Guide 1.8 Personnel Section and Training, ANSI N18.-1971, Selection and Training of Nuclear Power Plant Personnel, and ANSI/ANS-3.1-1978, American National Standard for Selection and Training of Nuclear Power Plant Personnel. The information used in making the comparison was obtained from personnel history, education and experience resumes, employment histories, training records, and training record summaries. Additional information was obtained from staff members during informal interviews. The length of service with Commonwealth Edison Company and specific assignments during the service period were also considered.

The Radiation/Chemistry (R/C) Supervisor holds a bachelor degree with some postgraduate work in chemical engineering and has participated in three-week formal radiation protection training course. He has been assigned to Zion Station since 1971, principally in engineering or chemistry functions until 1978 when promoted to Rad/Chem Supervisor. The incumbent does not appear to meet the recommended or required experience in radiation protection specified in Reg. Guide 1.8 C or Section 4.4.4 of ANSI N18.1, or ANSI/ANS-3.1.

The Station Health Physicist (HP Group Leader) holds an M.S. in Radiological Health, has been at Zion station since December 1977, and has been HP Group Leader since June 1978. He will have four years of professional experience in applied radiation protection with the company by June 1980. At that time, it appears that he will satisfy Regulatory Guide 1.8 requirements for RPM.

The health physics group (5) includes three individuals with academic degrees (one M.S. in Health Physics and two B.S. in physics and biology, both with training in Health Physics) and two engineering assistants (one with nuclear navy training and experience and one trained by Commonwealth Edison Company). These individuals, with one exception, are presently qualified as Staff Specialists (ANSI N18.1) or Technical Support Personnel (ANSI/ANS-3.1). The one exception noted was a recently employed, academically qualified (B.S.) individual with no previous nuclear power plant experience.

The Station chemist (Chemistry Group Leader) and two chemists meet the requirements of ANSI N18.1, Radiochemistry, and ANSI/ANS-3.1, Chemistry and Radiochemistry. Two other chemists will satisfy the experience requirements in July 1980.

Academic background of the Radiation/Chemistry Foremen (3) ranges from high school graduate to A.A. degree holder with five to six years of Zion Station radiation protection experience. All three foremen meet the criteria for Supervisor Not Requiring NRC License or ANSI N18.1 and ANSI/ANS-3.1.

The RCT group includes 22 individuals with experience ranging from one to nine years with a group average of approximately 3.8 years. All RCTs are considered by the licensee to be Individuals Qualified in Radiation Protection Procedures. However, only twelve of the RCT's have at least two years of experience as RCTs and thus qualify as Technicians according to ANSI N18.1. Nine of the RCTs have at least three years experience and are qualified as technicians according to ANSI/ANS-3.1. Fourteen of the RCTs have at least one year additional academic training beyond high school.

## 3.3 Training

The Zion Station training department has separate classroom facilities and, as of March 1979, 12 full-time instructors, two of whom are qualified Rad/Chem technicians with ten to twelve years of station and nuclear navy experience. Lesson plans are based upon "NUS Nuclear Plan Instruction Guidelines" but have been modified and augmented to relate to Zion experience and NRC and ANSI requirements. Advancement is based upon attendance and graded examinations. Individual training folders and a master training matrix for station personnel is kept in the department. Maintenance of training records is hampered by the practice of assigning temporary clerks to the department.

The overall station training effort is measured at about 10% full time equivalent (FTE). An approximate breakdown of this commitment developed in discussions with plant personnel (Table 1) indicates that investment in RCT training is about half the overall station average, which is dominated by the operations department. The comparison assumes yearly replacement of three of the current staff of 22 RCT's.

The initial entry training program (NGET) for both employees and contractor personnel is of excellent quality. Topical selection fairly brackets radiation protection in theory and practice. The course includes demonstrations, video tapes, and a hands-on protective clothing drill. At the completion of the course an examination is given.

Annual four- ar introductory level retraining (NGER) is required for all stat. on personnel and contractors.

Station operators and maintenance personnel receive additional training in selected areas of radiation protection in step with regular advancement. Maintenance men are instructed in radiation health effects and the significance of instrument readings and records. Operators receive progressively more advanced training in basic radiation, instruments, and biological effects as they progress from Stationman (entry level position) to Operator B, to Operator A, to Nuclear Station Operator (NSO). Special courses in Rad Waste, Systems, and Emergency Preparedness are offered to satisfy special or recurrent NRC requirements.

Neither operations nor maintenance personnel are trained to the extent that they are qualified to perform independent monitoring. They may be adequately trained to use survey instruments under routine conditions for information purposes and are encouraged to use instruments during their rounds which are made without RCT accompaniment. However, they are not qualified to substitute for RCT's in performing independent surveys.

Initial training for personnel destined to be RCT's is of approximately 10 weeks duration. Following successful completion of this training, they are considered fully qualified in Radiation Procedures; station management makes no official distinction between technicians thereafter. Newer technicians have entered the department with significantly better basic training than their predecessors, as the training program was upgraded in 1978. RCT's shall need better training to acquaint them with methods for correcting nonuniform field readings to actual dose rates. Some RCT's were provided with an AEC training manual which contained a check on beta and photon correction factors. However, these manuals had not been included as part of RCT training nor as part of the instrument operating procedures.

Two of three present R/C foremen have been given an opportunity to upgrade their technical skills by attendance at a two-week intensive radiation protection course offered at a university. Licensee representatives indicated that the more recently appointed foreman will receive similar training.

Neither the foremen nor the other professionals have received practical supervisory training, except that one foreman is now in the early stage of a two year management program sponsored by the company at a nearby college.

A one-week, 2.1% Full Time Equivalent (FTE) RCT retraining course introduced in 1979 is a significant improvement over previous practices. The course provides an effective review of basic topics but not an in-depth treatment of more advanced or special topics, such as whole body counting, dosimetry, neutron monitoring, alpha counting, and interpretation of instrument readings under unusual conditions. Thus, basic objectives related to exposure limitation and discharge control are met, while more advanced objectives such as consistently high quality performance in specialized areas are not.

In general, the more advanced training is beyond the present capabilities of the Training Department alone and must be provided by professionals from within the Radiation/Chemistry Department. The need for such training is increased by the policy of not using specialists and the infrequent recurrence (Section 2) of certain jobs.

R/C Departmental training on procedure changes appears somewhat haphazard. Revised procedures are posted for RCT review and signoff. The inspectors observed that revised procedure ZCP301, posted on February 16, 1980, had not yet been signed by three RCT's on March 17, 1980.

Table 1.: ZION STATION RADIATION WORKER TRAINING

| Organization | Staff Level | Training Entry Level | Retraining | Approx. FTE |
|---|---|---|---|---|
| Operations | 41 | | | 18% |
| NSO | 18 | | 10 Weeks | |
| Operator A | 10 | | 4 Weeks + NSO | |
| Operator B | 13 | | 16 Weeks + OJT | |
| Maintenance | 85 | | | 7% |
| Nuclear Plant Training | | | | 3.0% |
| Craft Advancement Training | | | | 4.0% |
| Rad Chem | 23 | | | 5% |
| Annual Retraining | | | 1 Week | 2% |
| Entry Level | | 10 Weeks | | 3% |
| Station Average | 403 | | | 10% |

### 3.4 Emergency Training

Initial orientation for employees and contractors includes a very limited discussion of the station's emergency plan (GSEP), of the emergency plan implementing procedures (EPIP's), and of the individual's role in an emergency. Basically, the personnel are informed about emergency signals and assembly areas. This material is repeated during annual retraining (NGER) required for renewal of the security badge.

Quarterly drills are used for training purposes. Licensee conducted drills, however, provide minimal training to Rad/Chem Department personnel in emergency response. The medical drill conducted by the licensee's contractor, Radiation Management Corporation, does not involve the RCT's, and involves the professional radiation protection staff only in first aid duties or as victims. These drills are principally directed toward ambulance and medical personnel.

The drills have not included the use of environmental monitoring teams for verification of communications or familiarization with environmental station locations or simulated measurements and plume location. The licensee relies solely on his environmental monitoring contractor, Eberline Instrument Corporation, to collect and analyze environs samples. Drills are seldom conducted on backshifts or weekends to test how rapidly offsite plant personnel could respond to an emergency.

Interim emergency procedures (Section 4.3) for sampling of reactor coolant and containment atmosphere and for estimating stack releases based on portable instrument measurements have been developed. Licensee records indicate that the RCT's have been trained in these procedures. However, discussion with individual RCT's indicated that, in some cases, they did not have a clear understanding of their emergency roles with the exception of going to an assigned assembly area to await further instructions. Observations of the taking of reactor coolant samples by members of the appraisal team also indicated poor sample handling practices that would be hazardous if significant activity were present. In addition, it appears that drills involving complete performance of these procedures have not been held with the RCT's. The appraisal team therefore regards the status of training in this area as unsatisfactory.

## 4. Radiation Protection Procedures

### 4.1 Summary

Radiation protection procedures appear generally adequate for normal operations, although promulgation of certain departmental procedures to the entire station is uncertain. Station management support of the procedures was judged weak based on review of Radiation Occurrence Reports and observations of work practices in plant. (Section 8.5)

## 4.2 Scope and Implementation

General requirements for radiation work are to be found in the "Radiation Control Standards," designated as Radiation Protection Procedure RP1190-1. They apply to all personnel onsite. The "Standards," a negotiated document between the company and the union, is common to all Commonwealth Stations. At the time of this appraisal a new set of "Standards" was being negotiated to replace the current edition (November 26, 1976).

There are other Radiation/Chemistry Department procedures for radiation protection (RP) and Chemistry (ZCP). These define practices of the department in support of the "Standards," and generally vary between stations. However, some of these procedures do have wider applicability which may cause some uncertainty regarding training. These procedures are usually promulgated by sending copies to the other departments for review. The effectiveness of this review is not known.

Observed violations of the Radiation Protection Standards are supposed to be documented in a Radiological Occurrence Report (ROR) which brings it to the attention of station management. Anyone may write an ROR but in practice almost all are written by RCT's. At times, personality conflicts and/or work pressure may play a role. However, cases of repeated violations and repeating violators do occur, including, on occasion, a case that suggests deliberate disregard of the "Standards." These together with instances of violation observed by the appraisal team suggest that management support for good radiation protection practices has not appreciably improved.

Radiation/Chemistry Department procedures generally receive adequate ALARA review. Two exceptions are noted in section 4.3. Procedures and changes to procedures of other departments are not routinely routed to Radiation/Chemistry (R/C) for information or review. Procedures having health physics significance are supposed to be forwarded by the Technical Staff Supervisor, who reviews all procedures. The effectiveness of this screening could not be determined by the appraisal team. However, it is the opinion of the appraisal team that routine of information copies to R/C should supplement the screening by the Technical Staff Supervisors.

## 4.3 Emergency Procedures

Licensee compliance with TMI Lessons Learned (NUREG 0578) Category "A" items was reviewed by the Office of Nuclear Reactor Regulation [1/]. Selected procedures related to these items were also reviewed by the appraisal team.

1/ Letter A. Schwencer (NRR) to D. Peoples (CECo) dated 2/29/80.

ZCP23A (12/31/79) "Boron Analysis for Post Accident Conditions"

ZCP123A (12/31/79) "Hydrogen Analysis of Gas Samples"

ZCP500 (12/31/79) "Post Accident Sampling and Analysis"

RP1740-1 (2/4/80) Revision 2, "Monitoring High Activity Releases During Accident Conditions"

RP1740-3 (1/28/80) "Radioiodine Sampling Under Accident Conditions"

Procedures RP1740-1 and RP1740-3 fail to warn against purging canisters of noble gases by using compressed air in the counting room as is sometimes done now. The procedures should be amended to warn against this; more importantly, the current laxity with regard to this practice should be discontinued.

Procedure ZCP500 fails to include any precautions or limitations on containment sampling in the event of positive pressure there; nor does it address possible problems in sampling under high humidity conditions (Section 10.8). ZCP500 also calls for a lead cask in a dumb waiter to transport a hot sample from the sampling room to the hot laboratory. The availability of an adequate cask and the capability of the dumb waiter to handle it appear not to have been fully considered.

A limited number of observations were made of practices pertaining to routine sample collection (Section 10.7). These illustrated not only where ALARA could be use fully applied but also where, if not applied, the above emergency procedures could result in excessive exposures.

Development of procedures for calibration and use of improved in-plant iodine monitor (NUREG 0578 item 2.1.8.c) were awaiting receipt of two SAM-2 units from Eberline Instrument Co. Region III was informed shortly after the inspection that the equipment had been received and was undergoing test and calibration.

Procedures covering in-plant health physics functions of access control and in-plant surveys have not been formulated. The licensee is resubmitting to NRR revised emergency plans and procedures to reflect needed changes based on the lessons learned from the TMI-2 accident.

## 5. ALARA

### 5.1 Summary

Isolated examples of good ALARA efforts were seen but the station has no true ALARA program. There is no requirement for station departments to consider ALARA in their planning of work. Man-rem goals or budgets are not established, exposures are not predicted based on past experience, and there are no man-rem thresholds that demand formal ALARA review.

## 5.2 ALARA Program and Implementation

ALARA is a natural but planned extension of a quality Radiation Protection program. It reflects a serious commitment by management to limit both individual and total radiation exposure at the station. This can be accomplished by establishing a systematic review within all station departments to identify goals, to encourage a planned reduction of both individual and group exposure and to acknowledge good performance of individuals and departments in working toward these goals.

There is little evidence of a comprehensive, formal ALARA program at Zion. ALARA exists primarily as an activity of the Health Physics (HP) group within the Radiation/Chemistry (R/C) Department. Higher levels of station management are strongly oriented to operations; concern with exposures is largely limited to their impact on operations and to meeting the exposure limits of 10 CFR 20. Exposure reduction as an objective of the station or of individual departments was not mentioned by management personnel interviewed by the appraisal team.

No threshold criteria were available to define levels when formal ALARA reviews and approvals are required. Formal man-rem predictions for specific jobs were not required and were rarely made; formal projections for individual departments or for the station were not required.

In 1978, the licensee instituted a dose assessment program with the recording of dose by job or work order and work group. This information is provided by Health Physics to the departments involved, but they do not factor it into planning for similar or repeated jobs. Work requests require an estimate of crew size and man-hours but there is no estimate of man-rem based on past experience or forecast. Similarly, outage planning involves estimates of man-hours and crew size based on past outage experience but no estimate of dose by the involved departments.

In isolated cases ALARA type review has been used for a few major outage and maintenance projects on an ad hoc basis. In these instances allocation of equipment and reassignment of effort has made significant dose reduction. In other instances the ALARA review was not sufficiently comprehensive and thus produced limited results. A common problem is failure to provide sufficient advance notice to the Health Physics Group to permit an effective ALARA review.

An example of isolated effective effort is the use of special shielding for reactor head removal during the recent outage. This is also an example where the individual(s) appeared to receive no effective recognition or encouragement.

## 6. Exposure Control

### 6.1 Summary

Operation of the Zion program for external and internal exposure control, including external dosimetry, bioassay, respiratory protection, quality control, procedures, information flow, and record keeping, was reviewed with station and corporate staff. The official exposure record system was discussed with other corporate representatives by telephone. Bioassay was discussed with a representative of Radiation Management Corporation (RMC), the licensee's contractor.

This review indicated that the basic resources are available for a complete and satisfactory program. However, to achieve high quality performance the program resources require additional direction in several areas. Program objectives, normally the function of the corporate office, are not stated. Standards of performance, Quality Assurance checks, and internal audit functions are not identified for the guidance of station personnel using the program. In addition, specific weaknesses in whole body counter operator training and airborne radioactivity area practices need correction.

### 6.2 External Exposures

The day-to-day control of exposures using both self-reading and paired non-self-reading pencil dosimeters appears to function quite well. Data from this program is available for use in a computer program which permits analysis of man-rem exposure by jobs, as well as a running total throughout the exposure period.

The pencil QA program, which includes leak testing, drop testing, and calibration on a set frequency, is comparable to that suggested by ANSI N13.5 "Performance Specifications for Direct and Indirect Reading Pocket Dosimeters for X and Gamma Radiation."

A well defined action level signals the immediate processing of film dosimeters and the implementation of additional control to restrict additional exposure. However, it should be noted that the greater frequency of processing which occurs during outages may result in less accurate occupational exposure data for each employee and may result in increasing the overall man-rem exposure for the outage.

The computer edit-audit and pencil programs coupled with timekeeping records and surveys result in a wealth of exposure data useful in exposure investigations. However, as noted in Section 6.5 official record changes are not satisfactorily documented and do not necessarily include cross references to the various forms of exposure data mentioned above.

The film badge dosimetry program lacks certain quality assurance features expected of an official dose registration program.

During the last two or three years spiked dosimeters occasionally have been processed with the routine dosimeters. However, no formal spike or testing program exists to demonstrate the quality of each dosimeter period. (See ANSI N13.11, "Draft American National Standard Criteria for Testing Personnel Dosimeter Performance.")

Under the Landauer contract only three control (background) dosimeters are provided with each batch of dosimeters. This is an insufficient number of control dosimeters to provide one with each processing that occurs. As an example, during an outage dosimeters are returned daily for processing in addition to those that are held for the full two-week exposure period. A control dosimeter along with a spiked dosimeter should be available for each of the groups returned for processing.

The bulk supply of dosimeters which are not immediately assigned to employees or contractors are kept in an unshielded (potentially high background), hot (85 to 90°F during the period of inspection) location. The control dosimeters are maintained at this location. However, there are two badge racks, one located in a similar environment to the bulk dosimeters and the other one located in a lower background, lower temperature area near an entrance to the building. Thus, the three control dosimeters which are to be used for "background" subtraction can result in errors, both conservative and nonconservative, with respect to individual dosimeter results.

A potential problem exists in the measurement and evaluation of exposures within containment during operation which result from normal photon energy associated with reactor equipment as well as high energy photons from nitrogen-16. The staff is well aware of the fact that the ionization chamber instruments underrespond to high energy photons from nitrogen-16 and that film badges overrespond and TLDs underrespond. However, there is no adequate method presently available to more accurately estimate the actual exposure. Since the film dosimeter overresponds, the error is conservative. However, it would appear that a special high energy equilibrium cap should be developed for use with the ionization chamber instrument to modify response. A study would be required to confirm the characteristics of the instrument with this correction in the presence of nitrogen-16 photons as well as other photons normally encountered.

## 6.3 Internal Exposure

The internal exposure control program contains necessary elements, including engineering controls (lock-up, ventilation control, etc.)

and the use of respirators for work involving actual or potential contamination appears to be adequate.

However, additional conservatism should be introduced into the program to ensure that proper decisions have been made in each case.

All radiation workers receive routine bioassay (usually a whole body count) from one to three times a year, depending on their work. Procedure RP1340-2 requires nonroutine bioassay if internal contamination is suspected or if nasal swabs or facial contamination exceed 10,000 dpm. Nasal contamination is not a certain indicator of intake. For a mouth breather it may be negative despite appreciable internal contamination. Moreover, the efficacy of nasal swabbing is highly technique dependent. The licensee, therefore, should not place strong reliance on nasal swabs as an indicator of internal contamination. Whole body counting is a better means of screening and evaluating possible intakes.

If the whole body counter fails a "spot" bioassay sample is collected to comply with a requirement to determine possible internal exposure. An occasional problem of insufficient sample size has been encountered by the bioassay contractor. Minimum requirements for this program should be compared to those in ANSI N343-1978, "American National Standard for Internal Dosimetry for Mixed Fission and Activation Products."

The formal measurement program appears to have adequate physical resources (whole body count, bioassay) supplied by RMC. Zion does not make periodic unannounced "spiked phantom" source tests of the whole body counter capability. The station is dependent on vendor QA. There is no spiking program for bioassay samples, and no summaries of potassium-40 or background data are reported to the station. The daily source check data are not supplied to the station for review.

Routine operation of the whole body counter is rotated among the Radiation Chemistry Technicians (RCT's); as much as a year could elapse between successive assignments by a given RCT. An engineering assistant from the HP group provides overview and will provide help if he perceives that an RCT is uncomfortable with the assignment. However, there is no established routine for providing retraining to bridge the gap between rotations. This must be done if this type of rotation continues. A better solution may be to train and assign specialists to the whole body counter. It was indicated that, under a new contract, RMC is willing to provide training four times per year. The licensee should use this opportunity to upgrade the training of anyone involved with operating the counter.

The whole body counter is also dependent on continued operation of an associated small computer. If the computer fails there is no means of operating the whole body counter in a manual mode, and station staff (health physicists or RCTs) have not been trained to analyze the data. Additional flexibility should be provided to permit interim use of the counter in manual mode until RMC can either correct the problem or replace the unit. The current RMC contract requires correction within seven days, which is much too slow when the flux of transient workers is high.

## 6.4 Respiratory Protection

The licensee's use of respirators is generally consistent with 10 CFR 20.103 and Regulatory Guide 8.15. The program incorporates medical approvals, control of issue, quantitative and qualitative fitting, inspection, cleaning, and MPC-hour accounting, and requires nasal contamination surveys and/or whole body counting in known or suspected cases of exposure to airborne radioactive materials. Basic engineering controls include hoods in the hot laboratory and sampling room, directed air flow for steam generator entries, and a closed system for head venting.

Air sampling in support of the program appears to have been adequate during refueling outages. However, it has been weak during routine operations (Section 8), owing partly to the practice of posting areas as airborne at 5000 cpm/ft$^2$ (approximately 5000 dpm/100cm$^2$) independent of any actually measured airborne activity (Section 7.6). By directive dated April 3, 1978, full face respirators are required at 200,000 cpm/ft$^2$ and fresh air respirators above 500,000 cpm/ft$^2$. Tests by the licensee have shown the threshold level to be conservative and by inference the level requiring fresh air. The intermediate level does not appear to be well founded if compared with the increase in allowed protection factor (PF) for a full face respirator.

More significantly, the practice appears to have resulted in the taking of fewer air samples.

At the time of the appraisal, the licensee was taking steps to upgrade air sampling in these areas. Thresholds for decontamination of such areas and better definition of respirator requirements based on contamination levels are also needed.

## 6.5 Occupational Exposure Records

The occupational exposure records system is seriously deficient in that it fails to provide for documentation checks and related error and omission controls procedures required for good legal records as suggested in ANSI N13.6 "Practice for Occupational Radiation Exposure Records Systems."

The computer used to generate the "official record" has far more versatile program capability than is presently used. Additional programming could facilitate retrieval and analysis of selected dose data for detailed health physics planning and ALARA review.

Corporate Health Physics has not developed performance standards which would establish minimum required contents for occupational exposure records. Nor are quality checks and accuracy limits specified. It is evident that changes are made in exposure records via computer without authenticating notes entered in an appropriate computer file. Change, deletion, and addition records are not permanently filed (microfilmed). The computer record should detail all original entries analogous to routine research and accounting records.

Form 4 data are entered into the computer without a second entry by another individual to ensure accuracy of the data. Generally, the only data within that file that can be tested for accuracy are social security numbers, which reach the file two ways: (1) by direct entry off Form 4 and (2) as the identifier with dosimetry data. The computer program does not make beneficial use of an easy edit-audit to verify not only social security numbers but the name and birthday, which are available through both records. Currently, because of the lack of a broader audit of personnel data on file, it is possible for more than one occupational exposure record to exist for the same individual. During the appraisal, NRC Headquarters questioned the termination reports on at least two individuals having multiple entries at the station during a previous year. Start or termination dates are not available on the computer record. Unless the termination date could be obtained from some other record, it is not possible to determine when an individual terminated other than within a given badge period. Without start and termination dates it is difficult to explain gaps in exposure records.

Data for the computer program are finalized once a year at the end of the annual exposure period. A draft of the final report, together with a "dud" list containing unresolved inconsistencies and other system data is provided to the station for a review of accuracy. Since there is no requirement that all "duds" be corrected before the final submission and termination of the annual report, these reports can be incomplete or can contain holes in an individual's occupational exposure record. Once these reports are completed and microfilmed without the proper annotation as to the resolution of all of the "duds," voids in data, etc. can be an indication either that data were not available or were not included.

Historical records for each occupational worker as suggested by ANSI 13.6 are not centralized. Selected items are maintained in separate files throughout the R/C office. As indicated previously, supporting records as to the basis of changes made to occupational exposure records are not necessarily a part of these files. An exception to the rule is any investigation of occupational exposure exceeding a reportable limit and forms that are generated in the event of a lost dosimeter. A change made by the film processor without annotation in the computer or a paper file is an example of one of the unavailable historical records. Records are maintained only of nasal and skin contamination in excess of 3,000 counts per minute. Again, N13.6 suggests that records of any positive contamination which could potentially result in internal exposure should be a part of the occupational exposure record. Reports of negative findings based on whole body counts or nasal smears are important additions to any complete occupational exposure record.

The Form 4's are processed and maintained differently, depending on whether they are associated with station or contractor personnel. Forms are stored in separate folders for station personnel, while the contractor forms are located in a loose-leaf binder at the foreman's desk. Several times during the appraisal it was noted that the forms had torn loose from the binder and dropped on the floor. No system exists to account for all Form 4s. Thus, the loose bound forms could conceivably be lost. A serial number used to identify the dosimeters or a serially numbered set of Form 4s could improve the management control.

## 6.6 Emergency Conditions

Provisions for dosimetry service for unusual situations or emergency conditions appear adequate. However, turnaround time could be a problem under some circumstances. The current dosimetry contract suggests that emergency processing for a dosimeter on a back shift could take at least eight hours. A mobile or replacement whole body counter might require several hours to place into service.

Facilities at other Commonwealth Edison stations should provide significant backup capability in the case of emergency. Arrangements for transfer of samples or personnel by plane were not confirmed.

Additional supplies of respirators are available in stores at Zion Station in addition to supplies that could be obtained from sister stations. Capability for refilling air bottles within the plant is limited.

The decontamination/medical facility is provided with potassium iodide tablets for thyroid blocking. RMC provides the tablets and the licensee's medical director has prepared a directive to each plan describing their use.

The licensee's Emergency Plan Implementing Procedures (EPIPs) include means to control rescue and recovery operations and to conduct first aid and decontamination of victims. The decontamination/ medical facility appears adequately equipped to limit exposure and remove contamination. The inspector reviewed a radiological occurrence report pertaining to rescuing and decontaminating an injured person on December 28, 1979. This report indicates that the roles and authorities of the individuals involved need to be clarified.

Practices concerning personal dosimetry for personnel who enter the reactor building need to be defined.

## 7. Access Controls

### 7.1 Summary

The licensee uses acceptable designations for areas requiring special access controls. Within the restricted area (defined by the security fence) is a controlled area that includes the auxiliary, fuel, and containment building. Almost all areas requiring special postings and access controls based on radiation protection considerations (radiation, high radiation, airborne, radioactive materials, and contaminated areas) are within the controlled area.

Unacceptable practices regarding access to the controlled area, including noncompliance related to high radiation area access control, were observed during this inspection.

### 7.2 Restricted Areas

The restricted area as defined by 10 CFR 20.3 is, at Zion, identical to the protected area defined for security purposes. All major structures (service, turbine, auxiliary, fuel, and containment buildings, and the circulating water intake) are within this area. Access, through a guard house, requires a security badge or escort.

Without further qualification, such as personal dosimetry and radiation protection training, access is limited to the service (office) and turbine buildings and the grounds outside the buildings.

### 7.3 Controlled Area

Unescorted access to controlled areas requires completion of radiation protection training (NGET) in addition to a basic security orientation. The emergency information card provided to visitors states, in part, "Do not enter any area labelled 'Controlled Area' or 'Radiation Area' unless you have been issued proper dosimetry by the Radiation Protection Department." The controlled areas are identified on this card.

Normal access to the controlled area, consisting of the auxiliary building, the fuel building, and both containments, is obtained by entry to the auxiliary building. The principal access control point on the 617' elevation adjacent to the Radiation/Chemistry (R/C) office is not subject to continuous observation and control. Although RCT's correct access control violations when they observe them, it is easy to enter the controlled areas without the required film badge or pocket dosimeters. More importantly, lack of knowledge of individual entries would undermine accounting for personnel, should an accident occur.

The problem is exacerbated by the existence of three other personnel doors (one on 617' and two on 592') and a large equipment door (592' elevation) which are unlocked, unalarmed, and unobserved. Although the four personnel doors are provided with hand and foot counters, they permit uncontrolled traffic between the auxiliary and turbine building. Should contaminated articles be removed by one of these routes it appears likely that such items could be removed from the plant without detection. No such occurrences were observed or otherwise indicated during the inspection; however, station rumor suggests that such has happened.

## 7.4 Radiation Areas

Radiation areas observed were properly designated and posted. The entire controlled area is designated as a radiation area; in addition, the specific radiation areas are posted and segregated by permanent or temporary barriers. The program would be improved if postings were more informative about general radiation levels. Excepting the general concerns about controlled area access described previously, the radiation area controls are adequate.

## 7.5 High Radiation Areas

High radiation areas are maintained locked except when occupancy is required. Access is controlled by eight "R" keys, kept by the Shift Engineer (7) and the Radwaste Foreman (1). Procedure requires that an employee making entry obtain a key from the shift engineer along with the log for that key. The destination is entered in the log and the log is left with whomever is in attendance at the control room center console. The employee checks conditions at the R/C office and is supposed to phone the control room when actually entering the area. To be effective, this control method requires not only that notifications be made faithfully but also that the control room be continually aware of entries to permit prompt investigation if an exit notification is overdue. That the system does not always work was illustrated by an event that occurred during the inspection.

Anchor bolt inspections were being performed in containment and other high radiation areas while the plants were operating. Because of the number and duration of such entries, "R" key control for this work was assigned to a single stationman on each shift. The stationman retained the key by admitting people to the high radiation areas, including containment, kept a log of entries and exits, and further telephoned the entry and exit information to the control room. As the stationman performed his function in various areas of the auxiliary, visual contact with the unlocked containment access points was lost and, along with it, the certainty that unrecorded entries or exits had not taken place. From discussions with control room personnel, it was evident that they were not always sure if anyone was in containment at any given time. This was confirmed at about 8:45 a.m. on March 14, 1980, when the staff wanted to move Unit 1 in-core detectors and had to send someone into containment to ascertain whether anyone was there.

This matter was discussed with station management the same morning; the containments were cleared and secured and not reentered until a guard was posted to control access.

Loss of positive control as described above is an almost predictable outcome of the "R" key procedure. Control would be considerably simpler if the plant technical specifications contained the waiver to 10 CFR 20.203(c)(2) for areas below 1000 mrem/hour seen at some plants. Opportunity for even better control may be offered by computerized electronic key card systems. Such systems can be set up to meet the requirements of 10 CFR 20.203(c)(2). Zion Station is adopting a computer based system for security access control to vital areas but appears not to have considered extending its use to include access control and accountability based on health physics considerations.

A violation of high radiation area control was also identified on March 17, 1980, because of the presence of a ladder which permitted access to the top of the shield surrounding temporary demineralizers on the 592' level of the auxiliary building. The exposure rate at the top of the shield ranged from 10 to 20 mR/hr, and from 50 mR/hr to 2.5 R/hr over the top of the demineralizer. It was RCT practice to use the ladder for making surveys of the demineralizer. It was also noted that no means of escape was provided for anyone who might become locked behind the shield wall. Thus, the licensee failed to establish necessary controls on access to a high radiation area, contrary to the requirements of 10 CFR 20.203(c)(2).

Although high radiation area postings were found to conform to regulatory requirements, significant improvement would be gained and ALARA better served if local postings also specified the actual range of radiation levels. This is particularly true where an entire large area such as containment is designated, for convenience of control, as a high radiation area even though only limited portions of it have radiation fields high enough to qualify.

## 7.6 Airborne Radioactivity Areas

By procedure, the licensee posts airborne areas when air samples exceed 25% of MPC. In addition, areas with contamination levels above 5000 cpm/$ft^2$ (approximately 5000 dpm/100 $cm^2$) are automatically posted as airborne (Section 6.4). The method warns of potential resuspension problems but area postings neither indicate the actual level of contamination nor the actual level of airborne activity based on air samples.

## 7.7 Contaminated Areas

The methods used for contamination control, posting, barriers, and step off pads is good. The step off pads are imprinted with specific instructions which are useful in reinforcing proper protective clothing removal techniques. Smear surveys are a part of the routine and special survey program. The number of smears collected, however, is largely RCT dependent; certain RCT's are more diligent in this area than others. The Zion Station Procedures, RP-1480-2, Contamination Surveys, refers to 100 $cm^2$ smear areas; however, in practice a more conservative 1 $ft^2$ area was used by some RCT's observed. During this inspection, several occurrences of contamination spreads to clean areas resulted from the failure of station and contractor personnel to adhere to prescribed contamination control practices. (See Section 8.5.) The existing procedures for contamination control appear to be adequate if followed and enforced. However, there is some indication that at least part of the plant staff view radiation protection and contamination control as the responsibility of the RCT and stationman staff. Efforts to clean up contamination spreads are apparently prompt and effective when they involve high traffic areas or unduly limit access. However, certain contaminated areas in low traffic, radiation, or high radiation areas are allowed to exist. Such areas are decontaminated in support of specific activities as it becomes necessary. Use of contaminated tools is governed by RP 1440-1, "Hot Tool Procedure," which specifies limits for unshielded storage (6000 cpm above background), contaminated tool marking (purple paint), and supervisory approval for transporting contaminated tools. Two examples of noncompliance with Technical Specification 6.2.B for failure to follow this procedure are described below.

1. A spot check survey of three contractor tool boxes in the Auxiliary Building by an RCT was performed at the request of an inspector on March 19, 1980. All tool boxes were marked with small labels indicating contamination to 25,000 cpm. Contaminated tools and equipment from less than 1,000 to 15,000 cpm were mixed with uncontaminated tools. The only contaminated item which was plastic bagged was a tool tray (less than 2,000 cpm). None of the contaminated tools or equipment were marked or otherwise identified.

2. Tools used by station maintenance personnel during a filter change on March 14 and left on the floor of the Auxiliary Building, 592' level, (Section 8.5) were surveyed on March 19. The extension wrench indicated approximately 30,000 cpm, 2 mR/hr gamma, and 90 mrad/hr beta-gamma. The tools were not bagged or protected, were unmarked, and were only partially protected from the floor by plastic sheeting.

The procedure also refers to a "Low-Level Contaminated Tool Storage Room" and a "High-Level Contaminated Tool Storage Room." Although the procedures refer to such locations, no specific locations are identified. The inspector was unable to identify the location of either tool room through questions addressed to the R/C Foremen and RCT's.

It appears that contaminated tool control procedures are not followed nor are they actively pursued by the Radiation Chemistry staff. When coupled with uncontrolled access to the Auxiliary Building it appears that contamination spread, personal contamination, and removal of contaminated material from the Auxiliary Building are possible consequences.

## 8. Surveillance

### 8.1 Summary

The quality of the licensee's radiation protection survey program was judged from record review and from extensive observation of routine and job related surveillance. Program weaknesses included nonrepresentative routine air sampling and nonuse of radiation work permits in favor of direct RCT coverage in more significant work situations. Quality of RCT and radiation worker performance varied greatly. Poor or marginal work observed under normal conditions would be unacceptable under accident conditions.

### 8.2 Routine Surveys

Zion station basic radiation survey procedures and performance are satisfactory for exposure and contamination control. Routine area monitoring reflects good basic training. Air sampling, by contrast, is perfunctory. As observed on one work shift, a single air sample (Staplex) was collected on the 579' level of the Auxiliary Building. The sample was collected at the elevator, a heavy traffic area. There are several airborne contamination posted and barricaded areas on this level but floor contamination rather than air sample criteria were used in establishing these areas. (Section 6.4) The conservative practice of defining airborne contamination areas on the basis of surface contamination concentrations and possible resuspension has been allowed to undermine interest in actual air concentrations. Also, one sample per survey in a high traffic area cannot be considered representative.

As observed during one work shift, monitor training and site adaptation were excellent. Survey findings, including both positive and negative data, exposure levels, contamination, and special findings, were completely recorded. The survey included all areas and equipment in the designated portion of the Auxiliary Building. The record was complete and available for reference the following morning. Past records are filed and available for trend analysis. As indicated by records, the Auxiliary Building is completely surveyed each week. Especially vulnerable areas are surveyed each night.

During the appraisal, contractor personnel working inside containment were being monitored by contract radiation protection technicians from NUMANCO Inc. Timekeeping and dosimetry records were maintained in the Radiation/Chemistry office. Surveys inside containment were conducted on an "as required" basis and entries into containments by contractors were accompanied by a contract radiation protection technician. During one such entry and survey, the technician paid full attention to ambient beta-gamma radiation levels on the way to and from the work site. Controlled entry and protective clothing were in accordance with instructions given in training. A neutron survey was made and stay times recorded. A brief report of the technician's survey findings were on file in the Radiation/Chemistry office thirty minutes after the job was complete.

During this appraisal, both reactors were operating and there was no occasion to observe RCT performance in support of high exposure and/or high contamination situations.

## 8.3 Job Specific Surveys

The method used to authorize and document controlled area work involving radiation protection concerns is not consistent. Special Work Permits (SWPs) are prepared by the RCT foremen, using the results of routine or special surveys. A sample of approximately 350 completed SWPs (January 1 - March 18, 1980) was examined. It was observed that all SWPs had been approved by a foreman, and none by unqualified RCT's. The serially numbered SWPs identify the working group, work location, and work to be performed, specify monitoring and protective equipment requirements, and provide specific instructions. Space is provided for approval signatures, SWP termination information, and workman sign-in.

As used at Zion Station, SWPs are issued for routine work not requiring continuous coverage by an RCT. In some cases workmen are required to act as their own timekeepers on SWP jobs; in other cases a timekeeper is assigned. In one case a single NUMANCO technician was acting as timekeeper for all SWP jobs in the Auxiliary Building.

Zion Station does not employ the concept of self-monitoring, except in specific cases; e.g., when an operator is making Auxiliary Building rounds. During the inspection several contractor organizations were engaged in pipe hanger or pipe fitter work. Most of these activities were conducted under SWPs. The SWP is not used for nonroutine work involving variable exposure rates, higher potential exposures, or other special conditions. Work of this nature requires the assignment of an RCT to personally monitor and control job site activities. SWPs are not usually prepared for work to which an RCT is assigned for direct coverage. Timekeeping sheets, usually based on self-reading dosimeter results, are maintained on such jobs. As a result, job specific information on higher potential exposure or unusual work is not formally recorded and is retained only in the collective memory of the RCT staff and is not available either for future job planning or plant wide ALARA considerations.

SWPs reviewed appeared to provide adequate information and guidance. Respiratory protection was routinely required for all work involving welding, flame cutting, grinding, and heating of contaminated or potentially contaminated systems or materials.

The preparation of SWPs is delegated to the RCT foremen. Members of the health physics technical staff are available for consultation during SWP preparation; however, according to the foremen such consultation almost never occurs. SWPs are not subject to a review or sign off by the technical staff.

### 8.4 Transuranic Alpha Activity

The appraisal team was informed that possibly significant alpha activity had been detected on a sludge sample taken from the Unit 1 refueling cavity in December. Positive alpha indication was given by a portable alpha monitor and the sample was packaged for offsite shipment for analysis by the RCT's. At the time of the appraisal, it had not been shipped but was stored in a hot laboratory hood. A portion of the sample was sent by the appraisal team to Argonne National Laboratory for analysis.

Alpha spectrometry indicated transuranic (TRU) activity of about 20 μCi/g, about a factor of 10,000 greater than seen in plant demineralizer resins. It suggests some degree of cladding failure; however, the licensee's daily analysis of iodine in the reactor coolant indicates nothing of significance. GeLi analysis of the sample was negative for cesium-137, an unexpected result if cladding failure was significant. It could signal a problem with the spent fuel pool demineralizer. The gamma to alpha ratio was about 1000, roughly that of the respective MPC (air) values, which suggests that gamma and alpha emitters would be about equally limiting for internal exposure. Licensee representatives stated that work in the cavity is done with respirators and that a few times gross alpha activity in the range of 4E-12 μCi/cc has been limiting. The positive identification of TRU and alpha counting uncertainties (Section 9.7) indicates the need for an expanded program of surveillance (air, water, contamination) within the plant in order to identify the sources and to maintain the working environment within acceptable limits. This matter was discussed at the exit interview and at management meetings on April 11 and 28, 1980.

### 8.5 Observation of Work in Progress

During the inspection a number of SWP and RCT controlled activities were observed. It was apparent that job coverage by RCTs was largely dependent on individual RCT qualification and dedication. Examples of very good to poor RCT performance were noted as well as good to very poor performance by personnel working under both SWPs and under RCT coverage. Two specific examples observed are reported below:

1. On March 14, a filter change operation was being conducted by plant maintenance with an RCT in attendance. The filter canister was located in a plug lid covered filter pit on the 592' elevation of the Auxiliary Building. After the filter had been changed, the maintenance crew informed the RCT that the job was essentially complete and he left the work site. After his departure, the maintenance personnel found that final assembly of the filter and reinsertion of the plug lid could not be accomplished from floor level. One of the maintenance crew, properly dressed in protective clothing and respirator, reentered the filter pit (maximum 40 mR/hr) in an attempt to correct the problem. After completing his work, he climbed out of the pit onto the unprotected floor. No control point was set up for this reentry, contrary to license procedure RP 1490-1. An RCT touring with the inspector observed this action and halted further work or movement. A smear of the floor disclosed approximately 200 cpm/ft$^2$ which had been tracked out of the pit. The RCT took appropriate action to correct the problem and ensure clean-up of the contaminated area. Following the local area decontamination and the replacement of the plug lid, the maintenance crew left the work area, leaving behind, in an unposted area, the extension wrench and tools used in the filter change.

   This final action was not observed. However, on several subsequent days the inspector observed the tools had not been removed. On March 19, the tools were surveyed at the inspectors' request and found contaminated in excess of levels permitted for Auxiliary Building storage. (Section 7.7)

2. On March 19, a contractor pipefitter crew was assigned to perform cutting and welding near the Boric Acid Storage Tanks (BAST) under a SWP. A survey indicated exposure rates of 40 mR/hr and smearable contamination of 1,000 to 10,000 cpm/ft$^2$ in the work area. The SWP required full protective clothing, as well as supplied air respirators "...when welding, cutting, heating or grinding contaminated materials." The workers were limited to exposures of 100 mR/day (self reading dosimeters) and were required to maintain their own timekeeping records. Intermittent surveillance was to be provided by NUMANCO Inc. technicians. The single NUMANCO technician assigned to timekeeping duties in the Auxiliary Building stated that he cautioned the workers about removing contaminated materials or performing work outside the contaminated work area. After removing a contaminated valve from the Boric Acid Storage Tank piping, a worker carried the valve across the step-off pad and was observed by another NUMANCO technician to be cutting the valve with a power hack saw in a clean aisle. The floor was not protected by any covering, and the worker was not wearing protective

clothing or a respirator. The NUMANCO technician stopped the work, required the workers to remain in position, collected a smear from the aisle (12,000 cpm/$ft^2$), informed the Zion Station radiation protection foreman, and assisted a RCT in followup activities.

These examples of poor radiation work practices among both station and contractor personnel indicate inadequate emphasis on adherence to radiation procedures. Based on one inspector's observations of these and other cases, it appeared that quality of RCT work may be partly dependent on how recently the RCT had been trained. However, no general conclusion could be drawn, as some very able RCT's had been on staff for a number of years.

The licensee makes almost no use of self-monitoring. Portable survey instruments are seldom used by any person except RCT's or contract technicians. Line operated "friskers" were not generally available at step-off pad areas, almost complete reliance being placed on observation of correct step-off pad procedures. "Friskers" were observed only at the containment step-off pads. A single portable G-M survey instrument for tool and equipment survey was located near the main auxiliary building access control point. It is obvious that contamination control at Zion Station is dependent either on exceptional and unfailing vigilance on the part of RCT and contract technicians or unfailing adherence to step-off pad and tool control procedures, neither of which was evident.

8.6 Emergency Monitoring Onsite

Onsite emergency monitoring will be the responsibility of the Radiation/Chemistry Department; other station personnel are generally unqualified (Section 3.3) to do it at the present time. During the offshifts, the two or three RCT's present will have to make needed measurements, both onsite and offsite, until additional help arrives (30 minutes to one hour).

Among the emergency tasks that may have to be done in that time are reactor coolant system (RCS) sampling and analysis, containment sampling and analysis, and estimation of airborne effluent releases. The Appraisal Team believes that a minimum of two people would be needed to do these tasks alone within one hour. Moreover, this capability depends on the availability of the laboratory and counting rooms or convenient backup capabilities. (Section 10.2)

According to licensee representatives, chemistry personnel and RCT's have been trained in the performance of interim procedures for post-accident conditions. Inspector concerns with this training were noted earlier (Section 3.4). The inspectors also discussed with control room personnel their duties as described by the emergency plan (GSEP). In general, the individuals contacted appeared well acquainted with their emergency duties.

## 8.7 Emergency Environmental Monitoring

The licensee has established the position of Environmental Director with responsibility for the entire (routine and nonroutine) radiological environmental monitoring program (REMP). As such, he also manages contracts with the environmental monitoring contractor (Eberline Instrument Corporation) and the meteorological contractor (Murray and Trettle, Inc.). During an emergency, the Environmental Director, who reports to the command center at the licensee's headquarters, is responsible for directing and guiding the environmental surveillance by the emergency team at the station.

Offsite monitoring during the first few hours is the responsibility of the station's professional health physics staff. Afterward, emergency environmental monitoring will be taken over by the environmental contractor. Neither the licensee nor his contractor had established any special procedures or survey forms or had outlined any special precautions or requirements for use by emergency response personnel.

As indicated earlier (Section 3.4), such matters as locating and following a plume and interpreting instruments have not been covered in drills held by the licensee. Drills with realistic scenarios are needed to test field procedures, communication links, etc.

There also appeared to have been no formal planning which addressed who would be assigned to the emergency trailer and exactly what function the trailer and its equipment would have during an offsite emergency.

Licensee emergency plan implementing procedure (EPIP) 500-4 (5/79) adequately describes the location of the environmental monitoring stations. Licensee representatives also stated that selected stations had been visited by selected Radiation/Chemistry Department personnel within the past year to learn their location and operation.

EPIP 500-5 (5/78) gives guidance to the offsite monitoring team on evaluating the consequences of plant releases. The procedure includes some information that is no longer applicable; therefore, it needs revision.

The inspector toured selected environmental monitoring stations; the air monitors were operable and the thermoluminescent dosimeters (TLD's) were properly placed. The meteorological tower and its recorders were found properly calibrated and in operation. Meteorological data are currently transmitted to the command center at licensee headquarters. Capability of plant personnel to use these data in direct computation of offsite doses is expected by the end of 1980, when the licensee expects to link the tower output with an onsite computer. Currently, the meteorological contractor is responsible for calculating offsite dose resulting from effluent releases. In addition, the Environmental Director is supposed to independently calculate whole body and thyroid doses at the site boundary.

## 9. Instruments

### 9.1 Summary

Instrumentation (portable, fixed, process, and control) associated with the radiation protection program was thoroughly reviewed. Calibration techniques were observed and maintenance efforts were reviewed. It appeared that most of the basic resources are available to provide the necessary high quality measurement and control program for safe plant operation. However, because of problems in selected areas, particularly in those associated with portable instrumentation, it was concluded that a significant effort will be required to introduce the necessary quality into the program.

This program lacks defined basic performance criteria, new instrument performance testing, and an internal audit scheme to ensure that the basic criteria are met.

### 9.2 Portable Instruments

The 60 portable dose rate instruments in the licensee's inventory should be adequate for routine use. However, because of the lack of good inventory control, the licensee was unable to state how many instruments and what type were actually available for use or how many had been lost or vandalized during the last refueling outage. Only seven were available in the instrument storage room on March 15, 1980, casting doubt on the licensee's ability to support an extended emergency requiring a large number of instruments.

Of the remaining ionization chamber instruments that could be accounted for, seven were assigned to specific RCT's for personal use (an attempt to reduce damage from vandalism or carelessness). The RCT's refused or were reluctant to use 12, owing to uncorrected shorting problems (five RO-3's) or to excessively long response time (four RO-4's and three RO-5's). In addition, seven of eight Teletectors were inoperable, owing to difficulty in getting replacement meter movements; maintenance of this instrument was a continuing problem for the licensee. Problems with the RO-4 and RO-5 instruments appears to result from a lack of basic quality assurance in the procurement.

Inoperable and contaminated instruments were found in the instrument storage room. In addition, instruments were found in plastic bags, their state of contamination and/or operability unknown. This is a poor practice suggesting that work is not being taken to completion. The status of instruments in this room should be unambiguous. They should be properly calibrated and ready for use.

Check sources were not supplied with each dose rate instrument and the number (4) of fan sources available was not enough to provide for ease of periodic checks in accordance with ANSI N32.3, "Radiation Protection Instrumentation Test and Calibration." In addition, the fan sources, while listing the expected instrument reading, did not give an acceptable response range (±20% suggested in ANSI N323); nor did the licensee's procedures.

The basic instrument maintenance program appeared good; no backlog was noted, except that caused by unavailable Teletector meters.

Calibration capabilities were adequate for a good program. However, the potential was not being realized, owing to a lack of basic built-in quality. The inspectors observed deviations from calibration procedures which were not evaluated or, in some cases, even recognized by management.

Among the problems noted by the inspectors in reviewing calibration records and observing calibrations were:

1. According to licensee records, quarterly calibration required by Procedure RP-1280-5 was missed, as follows, in 1979:

   RO2 Serial 630 - 3rd Quarter
   RO2 Serial 632 - 3rd Quarter
   RO2A Serial 370 - 4th Quarter

   This is regarded as noncompliance with Technical Specification 6.2.B, which requires adherence to radiation control procedures. Also, the quarter used was a calendar quarter, which led to recalibration intervals of up to 5 1/2 months in contrast to the NRC and licensee Quality Assurance Group position that a quarter is three months ±25%.

2. Calibration practices and procedures were not clearly defined or followed by the RCT's. A wrong jig was used in calibrating an RO-1, due apparently to an earlier instrument modification made without evaluation of impact on calibration practices.

3. RO-1 calibration points were not in agreement with procedures; lower scales using the 9.5 mCi Cs-137 source were calibrated with window open rather than closed.

4. Calibration procedures were not available at the facility and had to be obtained from the Radiation Chemistry office. The RCT suggested that someone must have thrown the book away.

5. Discrepancies as great as 20% were noted between response of selected station instruments and that of a calibrated instrument brought by the appraisal team. The calibration was reconfirmed

after the inspection. The discrepancy suggests a reference position error in the comparison with the licensee's. NBS calibrated "R" meter or a problem with the practice of calibrating station instruments at about 20% and 80% of scale (manufacturer's suggestion) rather than at midscale as suggested in ANSI N323. One instrument recalibrated at the midpoint more nearly met the upper and lower limits identified in the licensee's procedure.

6. Calibration source strength limits exposure rate to about 20 R/hour; yet instruments with much higher ranges (50 R/hr and 500 R/hr) are used without limitations. Range restrictions should be imposed or higher calibration points achieved.

7. Geiger-Mueller (GM) survey instruments were calibrated with pulse generators only; the detectors were not source calibrated. Sensitivity, energy response, and operating plateaus were therefore not verified.

8. Alpha and beta calibrations were not routinely done on instruments designated for such measurements.

9. The neutron source had not been calibrated since purchase in 1972. The jig used for neutron instrument calibration was broken but continued to be used in a makeshift manner.

## 9.3 Portable Emergency Instruments

The portable instruments available at the station are generally adequate for emergency response. However, the number available for supporting a sustained effort is questionable as previously discussed, and none go to 10,000 R/hr as suggested by ANSI N323 or TMI experience. The highest range station instrument is the Teletector.

Plant experience indicates that Teletectors are fragile and the replacement parts are hard to obtain. It should be noted that experience in the industry suggest that Teletectors may saturate as they approach 1,000 R/hr. The licensee should provide high range calibration if such instruments are to be considered for emergency use.

The equipment the licensee has designated for emergency purposes, in accordance with the licensee's Emergency Plan Implementing Procedure (EPIP) 500-3 and Appendix B for the Zion Station emergency trailer, both dated May 1978, was examined to verify that the items specified in the procedures were avialable for use and were maintained in an operable condition. The instruments examined included dose rate Teletectors, fast neutron detector, GM, alpha, and scintillation survey. The licensee maintains a limited supply of instruments in the control room and machine shop radiological kits and the GSEP trailer. The licensee had on order a portable GeLi system with multichannel analyzer and computer for gamma analysis. The emergency survey instruments calibrated on a quarterly schedule were found to have current calibration tags. The licensee plans to utilize the normal supply of portable survey instruments as backup support during an emergency. No check sources were available for the emergency instruments stored at the GSEP trailer.

9.4 Hand and Shoe Counters and Portal Monitors

Calibration of the hand and shoe counters and the portal monitors was inadequate. It was not possible to determine whether the hand and shoe counters were operating properly. No performance criteria had been established for either the hand and shoe counters or the portal monitors.

Hand and shoe counter calibration procedures suggest the use of a V-block source. However, current practice was the use of a small button source to check the operation. The emission rate of this source was so high that it was impossible to make comparison checks on each of the hand and shoe probes to determine adequate sensitivity and comparable settings.

The portal monitors at the guard house did not alarm when a cesium-137 source of approximately $10^6$ dpm was placed within a few inches of each of the tubes. It was concluded that approximately one microcurie of activity could be present on the clothing of a person passing through the monitor without being detected. The absence of friskers at local work areas (Section 8.5) means that great reliance is being placed on hand and show and portal monitors. It is important that the licensee's expectations for these monitors be well defined and adequately checked.

9.5 Fixed Area Monitors

The number and location of fixed area monitors were appropriate. A good maintenance and calibration program was in existence. Calibrations were routinely performed using a calibrated Cs-137 source in a fixed geometry. The application of the written procedures and the resultant calibrations appeared to be adequate. However, it should be noted that the range of the area monitors does not meet the guidance stemming from TMI for the guidance contained in ANSI N320 regarding emergency conditions.

Existing portable air monitors are being removed from service by radiation protection personnel, due to continuing maintenance problems. New PING 2A air monitors purchased for use in the plant are awaiting performance testing and calibration.

## 9.6 Effluent and Process Radiation Monitors

The number of effluent and process monitors is adequate for routine purposes. The maintenance program appears to be adequate to maintain the large number of monitors. A good periodic calibration program has been developed utilizing fixed geometry (spread sources in most cases). The nuclides used for calibration include Cs-137 for particulate air monitor, Ba-137 for iodine monitor, and Xe-133 and Kr-85 gas for gas monitor calibrations. Discrete, identifiable, fixed sources are related to the gaseous calibration for recheck. Liquid monitors generally are calibrated using replaceable liners which contain a liquid Cs-137 source.

The quality of the samples collected for counting by the process and effluent monitors is largely unknown. Air monitors had not been checked for in-leakage of air, historically a problem with this type of equipment.

Delivery systems have not been reviewed using ANSI N13.1 or some other method to estimate either the relative quality of particulate and iodine samples delivered to the air monitor or to estimate the line loss. No summary was available with identified sample line size, length, and number and radius of bends, and the exact location of sample collection. Such information could be extremely important during an emergency.

The gaseous and liquid effluent monitors were examined for operability and calibration. The monitors were found operable and located as specified. The effluent and process radiation monitors do not have sufficient range to be operable under emergency conditions as defined in ANSI N320 or TMI Lessons Learned. The range of the monitors was discussed with licensee representatives. The existing monitors will be replaced in 1980 with new monitors of increased range to meet the requirements of NUREG 0578.

## 9.7 Analytical Instruments

Analytical capabilities appear generally adequate to support normal operations. A questionable area was in-house alpha counting. Gross alpha approaching 3E-8 μCi/ml was sometimes seen in the fire sump and the lake discharge tank, but the station attitude appeared to be that there was really no alpha problem and that the results were likely an instrument artifact.

From instrument records, alpha count data and standardization appeared correct and adequately sensitive to ensure control of discharges. However, accuracy could not be confirmed, largely because the vendor, under a service contract, performs calibrations and sets operating parameters without a requirement to leave records of their procedures at the station.

Because of these uncertainties, water samples were forwarded by the Appraisal Team to Argonne National Laboratory for analysis. The results indicated alpha activity below the detectable level of 1E-8 µCi/ml confirming that alpha activity was not a problem in liquid discharge. However, further technical work is needed to resolve questions regarding reliability of the alpha analysis. Licensee representatives stated that they were in the process of acquiring new gas flow proportional counting systems suitable for alpha counting. Without better quality assurance and control than now exercised, alpha counting uncertainties could increase.

Laboratory quality control includes checks of RCT results by the use of spikes and blind samples. Procedures contain acceptance criteria and require notification when results are out of specification. Quality assurance audits in 1979 identified numerous occasions when notifications to management were unrecorded. Conditions appeared improved in 1980.

Computer problems were blamed by licensee personnel for the disagreement with the NRC Reference Laboratory over a series of split samples analyzed in May 1979 [2/]. Since then, the licensee replaced the GeLi spectrometer system with a computer based system (with redundancy) employing three independent GeLi detectors. During this appraisal, another comparison involving nine samples was made; the licensee agreement with the NRC Reference Laboratory was markedly improved.

## 10. Facilities and Equipment

### 10.1 Summary

The nonlaboratory working areas designated for Radiation/Chemistry are inadequate (Section 2.4). Otherwise facilities and equipment appear generally adequate for routine operations. The primary sample room facilities are inadequate for handling significantly radioactive liquids. Problems include leaking valves, insufficient shielding, and, possibly, the ventilation connection between sampling rooms and the hot laboratory. New sampling facilities are planned by the licensee.

### 10.2 Analytical Laboratory

Analytical laboratory facilities appear adequate for routine operations. The cold laboratory, hot laboratory, and counting room are all separate and appear to be of reasonable size. Xenon-133 background, once a common problem, no longer seems to be. Counting room temperature and humidity control were observed to be less well controlled than desirable for counting room work. These rooms are not on emergency power; however, portable power supplies were said to be available at the station.

2/ RIII Inspection Report No. 295/80-04.

The laboratories are equipped with fume hoods and with drains which are routed to holding tanks. Shielding appears to be limited and the licensee may have difficulty in handling curie levels of radioactive material as may be required during an emergency. The Sargent and Lundy shielding review (December 1979) also indicated possible Radiation/Chemistry area dose rates may range from 15 mR/hr to 100 mR/hr at one hour after a serious accident. If so, sensitive counting equipment would have to be relocated.

The counting room is generally well equipped with three computer based GeLi spectrometers, a computer based liquid scintillation counter, and a Beckman Wide Beta II proportional counter. Alpha analysis using the latter instrument appeared to be of questionable quality (Section 9.7); the licensee was in the process of acquiring replacement proportional counters.

Backup capabilities are adequate with complete counting room facilities available at other licensee plants. Additional analytical capability is also available from the licensee's contractor RMC. The licensee also has some onsite analytical backup with the receipt (shortly after this appraisal) of a cart mounted GeLi spectrometer that can be readily relocated.

## 10.3 Change Rooms

A permanent change area without lockers, showers, or washing facilities exists on the auxiliary building 617' level. An adjacent room also used for changing has a hand sink.

Other change areas with friskers are set up and manned near temporary job sites where contamination spread is a significant concern. The absence of showers and washing facilities at the change areas make contamination control more dependent on the use of friskers and hand and foot monitors. Problems with control are described in Sections 7.3, 7.7, and 8.4.

## 10.4 Personal Decontamination-Medical Treatment Area

The licensee appears to have an adequate personal decontamination/medical area located near the Radiation Protection Office on the 617' level of the auxiliary building. It is readily accessible from the fuel building and the Unit 1 and 2 containment building. The area is also convenient to the rest of the auxiliary building, laboratories, and counting room. All contaminated personnel, including injured personnel, are required to be decontaminated in this area. The area is well equipped with an examination table, including shower sprays to clean a contaminated person. Additionally, a regular shower, emergency supplies, first aid kit, respiratory equipment, and other supplies are provided. The licensee's offsite support hospital also has a decontamination emergency room set aside for such purposes. This room is used during the licensee's annual medical drill conducted by the licensee's contractor. The licensee has also provided first aid kits, stretchers, respiratory equipment, and anticontamination supplies at various locations throughout the station and in the Emergency Trailer.

10.5 Protective Clothing and Tool Decontamination

The licensee has adequate facilities and equipment for decontamination of protective clothing and respiratory devices. There are no formal facilities for drying respiratory protective devices. They are dried on rope lines in an unenclosed area of the auxiliary building near the laundry, using portable fans. After drying, the devices are returned to an issue and storage room, where they are inspected, surveyed, sanitized, and stored.

The licensee's tool decontamination facility, located on the 592' elevation of the auxiliary building, is an area of about six hundred square feet enclosed only partially by a wire mesh fence. There is no controlled ventilation or continuous air monitoring. The facility includes an ultrasonic cleaner, a cut-off 55-gallon drum on legs, and a curbed, grated area for washdown of large items. There was a large quantity of assorted tools and equipment inside the enclosure awaiting decontamination. Most of the individual items were not bagged, tagged, or otherwise marked.

The licensee expects contractors and station personnel to decontaminate the tools they use; however, it appears that much of the decontamination effort is left to stationmen. The stationman occupies an entry level position and may have had minimum experience and training in contaminated areas and with contaminated materials. An opinion heard several times was that an attitude problem exists with some craft workers with respect to work area and tool clean-up and decontamination. It was stated that such individuals believe that such work is beneath them and that the stationmen will do the clean-up.

10.6 Emergency Supplies and Equipment

Radiological emergency kits and supplies are maintained at seven locations throughout the station. Emergency radiation detection instruments are also located in the control room and machine shop.

During a tour of the emergency (GSEP) trailer, it was observed that several inventory items listed in Appendix B to the Emergency Plan Implementing Procedures (EPIPS) were missing. They included an air sampler tripod, a set of keys for the environmental monitoring stations, a pulse integrator, five 100 R self-reading pocket dosimeters, and a large waste container. This is identified as noncompliance with Technical Specification 6.2.A.4.

The purpose of the emergency monitoring trailer appeared not well defined and its equipping not well thought out. The mixture of materials and equipment appeared to be inadequate for either environmental monitoring purposes or as the resource center for the emergency personnel providing on-plant monitoring coverage. For example, high range and environmental level instruments and dosimeters were present but not appropriate check sources. Resources such as handbooks (NCRP, ICRP, IAEA, etc.), which deal with high level monitoring, dosimetry, and evaluation, or with contamination on soil or vegetation, were not present. The housekeeping and orderliness in the GSEP trailer were very poor. It was difficult to find each item on the inventory list; no drawers were labeled as to contents; and there was no apparent organization in keeping the trailer in a ready condition in the event of an emergency. This item was discussed in a previous emergency planning inspection and also discussed in an audit conducted by the licensee's Quality Assurance Department.

In general, it appears that the licensee needs to improve the maintenance of emergency supplies and to organize the storage of emergency supplies to ensure adequate preparation for an emergency.

The licensee maintains an adequate supply of protective clothing and respiratory protective devices by keeping an unused stock in a warehouse and employing an automatic reorder system. Some difficulties have been experienced because of long lead times on replacement parts for respiratory protective devices. The licensee stated that they could quickly obtain additional supplies from other CECo plants during an emergency if necessary.

## 10.7 Reactor Coolant Sampling

The unit 1 and 2 primary and secondary sampling stations are located in a single small room in the auxiliary building. Separate sampling sinks and hoods are provided for the two units. Because the emergency alarms cannot be heard in the sampling room, the door is customarily propped open during sampling. The pressure differential between the sample room and the auxiliary building was observed to result in an air flow out of the sample room. The air flow into the hoods, which was not high with the sample room door closed, was substantially reduced with the door open. The principal air supply path appears to be from the chemistry laboratory through the dumbwaiter shaft to the sample room. However, the effect of this pathway on possible spread of contamination between the sampling room and hot laboratory also needs to be determined.

Both primary sample sinks have been provided supplementary lead shielding for the below drain board level sinks and drains. No shielding is available above the drain board level. Most of the sample lines are unshielded. Some sample coolers and valves with extension handles are located behind a single thickness concrete block wall.

The steam generator sample sink drain is inadequate to carry the full flow. A supplementary drain line (plastic tube), which has been in use for an extended period, discharges excessive flow to a floor drain in the room.

At the time of the inspection the area monitor was believed to be malfunctioning and its abnormal behavior was being investigated. The RCT involved in collecting samples did not have a survey instrument available in the sample room. Thus, dose rates from samples collected and carried without secondary containers via elevator to the laboratory were unknown.

Problems with collection of certain samples were observed or reported by the RCT. A valve on a steam generator secondary sample line could not be fully closed to prevent leakage. A Unit 1 pressurizer liquid space sample could not be collected because of a broken valve. In place of this sample a condensed steam space sample was collected. Hydrogen sample bomb connectors were difficult to operate and under accident conditions would require excessive sampling time.

A valve control position indication board in the sample room had lights out in some cases and in others indicated that a valve was both open and closed.

Sample purge times appear to be adequate and are based on known sample line volumes and flow rates.

Under the conditions observed there was no significant exposure problem in connection with the collection of samples. A primary sample indicated only 15 mR/hr on contact with the area monitor probe in the sample room. The RCT used gloves during the entire sampling period.

The inspector questioned the RCT assigned to collect samples concerning his proposed response to a need for samples following a significant accident. The case proposed was the need to collect a post accident primary coolant sample which indicated 1000 R/hr at contact. The RCT was asked how he would go about the task. The response was that he would leave the sample room during the sample line purge period returning to collect the sample in a normal sample container (approximately 250 ml BOD bottle). When asked he stated that he would transfer this bottle to the dumbwaiter using his hands. When asked about supplementary shielding, pigs, or remote handling tools, he indicated that none were available. The inspector was later informed that postaccident sampling is dependent on the presence of a health physicist to direct RCT sampling activities.

The licensee plans to install a modified sampling facility which will provide protection for collection of samples during an emergency.

10.8 Containment

The shielding study performed by Sargent and Lundy indicated that containment atmosphere sampling from the planned post accident sampling points would probably not be possible. As an alternative the licensee proposed collection of atmosphere samples from the Unit 1 and 2 containment atmosphere monitors (RE-11/12) located in the auxiliary building. The collection of samples at these locations would appear to be possible from a personnel accessibility and sample collection capability standpoint. The inspectors learned, however, that the line supplying RE 11/12 has a significant low point between the sampling point and the monitor. In the event of a steam atmosphere in containment it is probable that the RE 11/12 sample line would fill with water, making sampling difficult or impossible. Licensee representatives informed the inspectors on April 10, 1980, that this likelihood had been verified and that a modification to the lines would be made.

10.9 Airborne Effluent Sampling

An adequate number of grab sample locations are available for collecting samples of airborne effluent. The adequacy of the sample locations for iodine and particulates can only be estimated after the delivery systems are analyzed. Line loss of particulates may be significant for several sampling locations.

Special equipment has been assembled as a temporary measure to estimate noble gas release from the auxiliary building vent in response to item 2.1.8.b of the TMI Lessons Learned report. 3/ The licensee is also progressing on a long range (targeted for January 1, 1981) improved sampling/monitoring system designed to permit sample collection during an emergency as well as during routine operations.

The inspectors also noted a potential problem in the licensee's practice of collecting gas samples by flowing through the sample bulb into the local environment. Under emergency conditions, excessive contamination could develop. Licensee emergency sampling procedures need to provide for proper return flow downstream of the sampling/monitoring device.

11. Radwaste Control

11.1 Summary

Radioactive waste handling practices at the station were reviewed, including facilities, equipment, and procedures for storage and release of effluents. Efforts to reduce waste volumes were reviewed

3/ USNRC Office of Nuclear Reactor Regulation, July 1979. NUREG-0578, "TMI-2 Lessons Learned Task Force Report and Short-Term Recommendations."

along with plans to upgrade the systems to provide better control and accomplish further volume reductions.

Generally, improvements were apparent in the overall system. However, three items are sufficiently important to require prompt attention by licensee management.

1. Ensure that an adequate safety review was performed for use of the portable demineralizers in their present location. (This is an unresolved item).

2. Resolve questions about noble gas leakage from systems in contact with primary coolant.

3. Complete radwaste facility addition.

11.2 Gaseous Waste

The principal route of airborne release during normal operation is the auxiliary building vent. Lesser activity is released during containment pressure ventings at power; containment purges are made only during shutdown.

Noble gases dominate the release; they are quantified from the effluent monitor record. Weekly (daily since December 1979) grab samples are taken for spectral analysis. Quantification for 1979 (the only year reviewed) appeared resonable although possibly overestimated owing to the assumption that the entire release is xenon-133, for which the monitor is relatively insensitive.

Administrative procedure ZAP 10-52-4, Revision 4, (2/5/80), "Leak Reduction and Control Programs," governs licensee efforts in determining the integrity of systems outside containment that are likely to contain radioactive materials. A daily inventory is taken using such parameters as liquid tank volume used and gas decay tank volumes and pressures. Licensee personnel believe they have a good estimate of system leakages and further believe that the gas system integrity is good. The Appraisal Team did not directly review the adequacy of the licensee's leak determination procedures. However, the team believes that the occasional presence of relatively short-lived noble gases in the Auxiliary Building discharge, together with the low frequency (three in 1979, none since June) of gas decay tank releases indicate possibly substantial leakage from the cover gas system. Licensee representatives stated that a modification is in progress to permit measurement of nitrogen makeup to the cover gas system as an aid in determining leakage.

A possibly related event occurred during the appraisal on March 18, when the particulate monitor (1RT-PR09C) on the Unit 1 containment purge exhaust alarmed. Shift personnel stated that no containment venting or purging had occurred; they stated that the alarm was associated with water transfer to the nearby refueling water storage tank (RWST). The licensee appeared content to let this matter rest. By the end of the inspection, the alleged correlation had not been pursued nor had the reason for an alarm on a shielded particulate monitor on a presumably unaffected system. The importance of establishing the cause of such operational occurrences was stressed at the exit interview and at meetings with licensee corporate management on April 11 and April 28, 1980. The implications of such an occurrence with accident grade water should be assessed.

11.3 Liquid Wastes

Control of liquid waste releases at the station appears satisfactory. Except for tritium released via the fire sump, all liquid waste is discharged from the lake discharge tanks (2) into the circulating water. Liquid is treated and sampled before transfer to these tanks; it is again sampled and analyzed before release on the authorization of the shift engineer. In 1979 the releases reported by the licensee were less than 10% of the annual design objective of 10 curies.

Since 1978, both Zion radwaste evaporators have been out of service and undergoing replacement and/or rehabilitation. Meanwhile liquid wastes were being treated by multiple cycling through portable demineralizers. The method has been effective in reducing the volume of treated waste released and presumably the man-rem associated with drum solidification of evaporator bottoms. During 1977 and 1978, production of liquid waste requiring evaporator processing and bottoms solidification was about 16 gpm, about twice the industry average. During 1979, a major effort at the station reduced production of treated liquid wastes to about 9.5 gpm, with a 1980 goal of 8 gpm.

The portable demineralizers are temporarily housed behind a water filled shield (Section 7.5) on the north end of Auxiliary Building elevation 592. Feed to the demineralizer was by a hose that traverses the entire length of the Auxiliary Building, partly on the 617' level and partly on the 592' level. The hose follows overhead piping runs six and one half to seven feet above the floor. An inspector measured approximately 15 mR/hr at contact with the hose. Had the hose been carrying highly contaminated water from a serious accident, access to significant portions of the Auxiliary Building could have been denied or severely limited. The question of whether the licensee made an appropriate hazard review pursuant to 10 CFR 50.59 for this temporary installation is regarded as an unresolved item.

The current system also presents the risk of leaks or spills as did occur on the last day of the inspection when hose failure leaked 30 to 40 gallons onto the floor.

Formerly the demineralizers were located within the radwaste facility. They were moved to the present location to avoid interfering with construction of an addition to the radwaste facility.

The addition will provide hard piping connections and space for liquid radwaste demineralizer processing and spent resin transfers and a crane for handling the portable demineralizer liners. The facility, now estimated at 90% complete, has been delayed for budgetary limitations until approximately May 1981. This facility should be completed on a high priority basis to improve reliability of the only operable liquid waste processing system now available, to reduce exposure and accident potential from routine waste handling, and to reduce the potential of very high dose rates in the Auxiliary Building in the event of a serious accident.

Present licensee plans for upgrading the liquid waste treatment system include completing repair of the Aqua-Chem evaporator, addition of a crystalizer (budgeted for mid-1982), and testing of a reverse osmosis unit for possible boric acid solution recovery with a commensurate reduction in the volume of liquid waste requiring treatment.

11.4 Solid Waste Control

The Zion Station design estimate (SAR) for solidification and packaging of radioactive waste was 24,800, 55-gallon drums during a 40 year plant operating life. Within six years 34,000 solidified drums were produced and the drumming equipment was worn out. The wastes solidified were principally evaporator bottoms from liquid waste treatment and spent resins from plant cleanup systems.

Subsequent to failure of drumming equipment in 1977 and evaporators in 1978 the licensee turned to portable demineralizers (Hittman HN100) for processing and solidifying liquid wastes during 1979. The overall effect was approximately a 70% reduction in the production of solidified waste from 1977 through 1979 (Table 2). Presently, the licensee plans to repair the Aqua-Chem evaporator and replace the bottoms drumming equipment. Past performances of the in-drum solidification system gives little encouragement for the success of this venture.

The radwaste facility presently includes a dry active waste (DAW) compactor which is old and of questionable operator safety. A new compactor on site is scheduled to be installed in the near future. It was reported that current plant practices require a Radwaste foreman to observe and certify the contents, by drum top initials, of all DAW drums prepared for shipment. When a shipment of drums is prepared, reportedly, each drum must be reopened and the contents reverified by a Radwaste foreman. Such a practice not only reflects poor ALARA planning but also raises questions concerning the quality of the seal of the reclosed drum.

In spite of inefficiencies resulting from facility and equipment problems, morale and enthusiasm of the Radwaste staff appears to be excellent. The volume of waste generated and shipped, or available for shipment, has shown a dramatic reduction.

Table 2 Volume of Solid Wastes Shipped

| Year | Cubic Feet Shipped | % DAW |
|---|---|---|
| 1977 | 83,101 | 25.7 |
| 1978 | 70,998 | 27.8 |
| 1979 | 21,533* | 49.3 |

*28,700 cubic feet was generated but the total could not be shipped because of the temporary closure of the Richland, WN burial site.

## 11.5 Waste Storage Capability

As designed the radwaste facility incoporated a below grade drum storage facility immediately below the radwaste facility. As a result of use or errors in design or fabrication, the roller system designed to permit the movement of drums along a series of parallel aisles failed some years ago and the stored drums could not be removed as easily as the planners had envisioned. As a part of the radwaste facilities upgrading, the drum storage facility has been cleared of jammed drums except for one aisle. The licensee plans to redesign and fabricate new drum transport equipment as a part of the facility renewal program. Currently drums of solidified waste, filter drums, and dry active waste (DAW) drums are stored in the access wells to the below grade storage facility and in the grade level, now unused, waste drumming area.

As a result of the failure of the radwaste evaporators and concentrates drumming equipment, during the period 1977-1979, no evaporator bottoms or liquid wastes were being solidified in 55-gallon drums. Filters are, however, being solidified in shielded 55-gallon drums. DAW is the principal content of 55-gallon drums being packaged at present.

The licensee had available a building designated for the storage of DAW drums and packages. At the time of the inspection, this building was essentially empty. The packaged waste on hand at the time of the inspection included approximately 310 drums DAW, 19 boxes DAW, and 35 drums LSA. DAW is being shipped to Barnwell, S.C. and less than 100 mR/hr contact LSA to Richland, WA. The licensee plans to begin shipments to Beatty, NV, in the near future. The licensee is attempting to ship waste as rapidly as possible in order to minimize onsite storage.

Liquid waste formerly processed by evaporator concentration is currently being processed in Hittman HN100 portable demineralizers. The liquid feed stock is variable and includes boric acid as well as radioactive material. The usual limiting factor in portable demineralizer use is the conductivity of the demineralizer effluent. A portable demineralizer liner contact exposure rate limit of 7.5 R/hr has been established to ensure that contained radioactive materials will meet shipping requirements after solidification.

As a result of the closure of the Richland, WA burial site by the State of Washington (October 4 - November 20, 1979), the licensee constructed a portable demineralizer storage facility on site. In order to use the facility a tractor-trailer and a crane are necessary. The facility consists of a 40-foot-square concrete structure containing 16 cells. The exterior and dividing walls are 1 1/2 feet thick. Each cell, containing a section of 8 1/2 inch wall concrete pipe as a supplementary shield, is covered with a 12-inch-thick concrete lid.

The limiting factor for plant operations is the ability to process liquid waste. Based on the quality of the liquid waste being processed at the time of the inspection, the portable demineralizer storage facility provides approximately a 32-week onsite storage capability.

Resins from the cleanup demineralizers are disposed by transfer to a Hittman (HN 200) liner and cask. The resins are disposed usually on the basis of demineralizer radiation levels (maximum 700 to 2000 R/hr at contact). The measurement of demineralizer radiation levels and a resin transfer "shoot" were observed. In order to measure the radiation levels a stepped conrete floor plug was removed using a 5 ton chainfall. An RCT then made measurements with an extended Teletector while prostrate on the floor with his head and one arm and shoulder extended into the opening. Because the chainfall was fixed and not mobile, the stepped plug was above the RCT. It was reportedly not possible to make measurements through a penetration on a lower level because the penetration was improperly located. It would appear that excessive reliance is placed on the ability of the chainfall to prevent a serious accident.

The portion of the resin transfer which was observed was performed acceptably. Hoses, (hard piping will not be available until the modifications to the radwaste facility are complete) add to the risk of a resin spill. The transfer is performed using motive water supplied by a pump whose controls are separated from the radwaste facility by a considerable distance. To ensure that the receiving cask liner is not overfilled, transfers are timed. In addition, a conductivity device is used to indicate a specific level in the receiving liner. In the event of overflow, a separate cask liner is connected by hose to the receiving liner. During the observed transfer, two radwaste foremen participated, one controlling the motive water and the other controlling activities at the receiving cask-liner. An RCT was present during the transfer. Before beginning operations, the telephone system between the pump control and the radwaste area was verified. Shortly before the transfer was to begin it was discovered that the telephone near the pump control had been damaged by vandalism. (See Section 2). The radwaste foremen were required to improvise communications, resulting in a less reliable communications system. The transfer was performed without incident. Following transfer and dewatering the resin was solidified in the cask-liner for shipment.

It appears that the licensee has minimized the onsite storage of solid waste and has provided adequate reserve storage capacity to offset unanticipated accumulation of solid waste.

## 12. Accident/Recovery

### 12.1 Summary

A number of licensee practices that have limited ALARA significance during normal operations may have profound impact on reentry or recovery operations under severe accident conditions. Some of these, such as leakage reduction, are preventive in nature. Others, through preplanning, serve to mitigate accident effects through reducing personnel time spent in a hostile environment. Included in the latter category are such matters as clear labeling or marking of valves, use of remote handling tools, shielding, library of photographs, models, and provision for remote television viewing. Inspector review of various matters of this kind indicated that considerable improvement was possible.

### 12.2 Reduction of Leaks Outside Containment

The station has developed and implemented a leakage control program for systems outside of containment. Leakage rates for gaseous and liquid systems have been measured and reported to the NRC. The program appears to be generally adequate for liquid systems. More work appears to be needed with regard to integrity of the gaseous systems (Section 11.2).

Liquid leakage control and reduction is based on the system routinely used at the station to confirm that unidentified leakage is below one gallon per minute, the technical specification limit. A daily water inventory balance, using a computer program, is supplemented by a surveillance program to identify and quantify leaks exceeding the limit. This basic program has been augmented in response to NUREG 0578 (Item 2.1.6.a) by a daily leak inspection program, which includes followup priority work requests to repair leaks observed, and a program of quantitative system leak measurements during refueling outages. Inspector observations, including those made during rounds with auxiliary operators, indicated no significant liquid leaks in the auxiliary building.

During the recent refueling outage, portions of the gaseous waste systems, including the compressor and gas decay tanks, were pressure tested with helium. Gas decay tank contents are either held for decay and discharge or returned to the system to provide cover gas for tanks holding liquids. Few gas decay tanks are discharged from the station. This and other indications (Section 11.2) suggest that gas may be lost from the system and discharged at low concentrations. Licensee representatives stated that a modification is in progress to allow measurement of nitrogen makeup to the cover gas system. This will probably be needed before the system integrity is well defined.

## 12.3 Remote Operating Devices/Shielding

Primary system filter valves may be controlled by remote operators or by reach rods. However, a portable shield originally designed for use during filter removal is no longer usable, owing to plant modifications that now prevent moving the cask through the corridors. Filters are therefore changed manually without benefit of this shielding. An accident involving very high liquid contamination would make filter replacement extremely difficult. The significance of this fact should be reviewed by cognizant station groups.

## 12.4 Labeling and Marking

Essentially all valves observed were marked with small embossed metal tags. It was noted that a small number of tags had become detached and were haphazardly attached to a nearby surface or object. Licensee representatives indicated that valve tagging was a recently completed project involving considerable time and some exposure.

The tags, while providing appropriate information, were small and not easily read. Under emergency conditions, an individual unfamiliar with a particular system might have difficulty in identifying one specific valve or operator from a number of similar devices in a particular area. Auxiliary building piping is not color coded and for the most part is not marked. Some marking of major lines was observed; e.g., main steam, and the licensee stated that piping is being labeled as time and personnel are available. (Misidentification of sampling lines occurred at Three Mile Island.)

## 12.5 Housekeeping

Housekeeping observed during the inspection indicated that there were lapses in good housekeeping practices by some members of the plant staff or contractors. It was noted that items of protective clothing and respirators were not infrequently abandoned casually on the floor or on equipment. It was apparent that the stationman staff was routinely picking up such items, since they were usually removed within 24 hours. Storage space is extremely limited, in that areas behind equipment in little frequented aisles or cul-de-sacs were used for the storage of supplies, cleaning equipment, and in one case, paint.

It appears that station-wide reemphasis of good housekeeping practices would be beneficial. It is recognized that the station had completed a two unit outage in January and that recovery from this outage was still in progress. Better cooperation by the plant staff and contractors would serve to speed the recovery.

12.6 Reentry and Recovery

Planning for reentry and recovery operations can be greatly aided by such things as models, photographs, and preplanned remote television viewing capabilities at access control points and key in-plant locations. Licensee representatives stated that facility plan view drawings, available in the emergency trailer, do not show pipe and valve locations. Neither are there models or photographs available in the trailer or at other offsite locations that would be readily available to aid in reentry. No provisions have been made for ready installation of closed circuit television cameras.

12.7 Expanded Support

Immediate and short term (approximately two hours) emergency response will depend on designated emergency teams manned by already onsite personnel and/or off duty station personnel called in. Station health physics staff could then be augmented by personnel from elsewhere in the licensee's organization and from licensee contractors.

Health physics personnel responding from other stations would be expected to bring with them survey instruments and other equipment. No written policy on this topic was available for review.

No position has been taken on what facilities are to be used by the expanded staff. The training building and the Westinghouse training facility were both mentioned as possibilities.

An accident on the scale of Three Mile Island would tax the facilities of even an organization as large as Commonwealth Edison Company and health physics support from outside the company would be required. The question of how to effectively use such support needs careful consideration.

13. Management Meetings

13.1 Exit Interview of March 21, 1980

The appraisal team met with licensee representatives (Section 14) at Zion Station at the conclusion of the appraisal on March 21, 1980. The appraisal findings discussed at this meeting can be classified as:

1. Significant appraisal findings (described in Appendix A of the letter transmitting this report) which must receive effective

corrective action if the radiation protection program is to be acceptable,

2. Findings or suggestions of lesser significance whose correction or implementation could improve the radiation protection program, and

3. Noncompliance items (described in Appendix B of the transmittal letter) which are to be addressed by the licensee as in the routine inspection program.

13.2 Management Meeting of April 11, 1980

The appraisal findings were also discussed at a meeting held on April 11, 1980, between Mr. James J. O'Connor, President and Chairman, Commonwealth Edison Company, and Mr. James G. Keppler, Director, USNRC Region III, and members of their staffs.[4/] The licensee described corrective actions underway or being considered related to the more serious health physics appraisal concerns, which were identified as:

1. Improvement in the quality of the radiation protection program through stronger management and management support,

2. Vandalism,

3. Alpha activity surveillance,

4. Personnel accountability and access control,

5. Contamination control,

6. Radioactive gas leaks,

7. Emergency response training, and

8. Liquid radwaste treatment facilities

A followup meeting was planned to further discuss corrective actions and completion dates.

NRC representatives also stated that the health physics inspections at Zion would be increased to follow licensee progress in these matters.

13.3 Management Meeting of April 28, 1980

Status of corrective actions regarding more significant appraisal items was discussed at a meeting between Mr. Cordell Reed, Vice

4/ Letter J. G. Keppler, RIII to J. J. O'Connor, CECo, dated April 15, 1980.

President, Commonwealth Edison Company, and Mr. A. B. Davis, Chief, Fuel Facility and Materials Safety Branch, Region III, USNRC and members of their staffs on April 28, 1980. The status of these actions, as summarized in the meeting report [5], is as follows:

Vandalism

1. Provide around the clock health physics supervision and shift inspection of plant radiation protection equipment by this supervision. (Accomplished)

2. Maintain Radiation/Chemistry Department laboratory and storage areas locked. (Accomplished)

Management and Management Support

1. Include health physics and chemistry supervisors in operations and maintenance daily meetings and in daily outage meetings. (Accomplished)

2. Institute a system to periodically evaluate Radiation/Chemistry Department personnel work performance. (In progress)

3. Require Rad/Chem Foremen to perform in-plant surveillance each shift. (Accomplished)

4. Review need for additional clerical help to reduce foreman workload. (In progress)

5. Enlarge Rad/Chem Department work space. (December 1, 1980)

6. Initiate Rad/Chem Technician (RCT) Log to enhance identification of significant items and their status. (Accomplished)

7. Resolve the literal discrepancy with Technical Specifications regarding the qualifications of the Rad/Chem supervisor by pursuing the matter with the Office of Nuclear Reactor Regulation. (May 30, 1980)

8. Complete review by a consultant of station Radiation/Chemistry organization, including RCT grade structure, possible health physics-chemistry separation, position and job descriptions, and ALARA program. (January 31, 1981)

Alpha Activity

Define and institute a written program for maintaining awareness of alpha activity within the station. (May 15, 1980)

5/ Letter J. G. Keppler, RIII to Cordell Reed, CECo, dated May 14, 1980.

Personnel Accountability and Access Control

1. Implement single access control point for the auxiliary building, giving consideration to personnel accountability. (July 31, 1980) Note: Multiple controlled access points may be established during outages.

2. Implement plan for improved high radiation area access controls. (July 31, 1980)

Contamination Control

1. Emphasize contamination control in training of and meetings with CeCo and contractor personnel. (In progress)

2. Optimize effectiveness of contamination detectors after completion of instrument sensitivity studies. (May 15, 1980)

3. Assign decontamination personnel to the Rad/Chem Department to maintain effective contaminated area control as needed. (Accomplished)

4. Perform periodic survey of maintenance shop tool crib. (Accomplished)

Sources of Inplant Radioactive Gas Leaks

1. Continue daily balance checks of waste gas system volumes to assess short term integrity. (In progress)

2. Install nitrogen flow instrumentation into the waste gas system and begin conducting long term evaluation of system integrity. (December 1, 1980)

3. Conduct leak testing of the Unit 2 let-down system during the upcoming outage and make necessary repairs. (During Unit 2 Outage)

4. Investigate present mode of operation of the volume control tanks whereby the tanks are isolated from the gas header and determine if this is the proper mode. (August 15, 1980)

5. Upgrade investigations of monitor excursions and other waste gas leakge symptoms to detemine source and extent of leakage. (In progress)

Emergency Response

1. Confirm Radiation/Chemistry Department readiness to implement interim emergency procedures. (May 9, 1980)

2. Review above training with all RCTs after the Unit 2 refueling outage. (July 31, 1980)

3. Compile emergency handbook for RCTs. (July 31, 1980)

4. Calibrate dose rate instruments on highest ranges. (In progress)

Radwaste Facility

1. Complete radwaste annex. (October 31, 1980)

2. Complete review to ensure that no accident grade primary water could be pumped through temporary piping to the demineralizers. (Accomplished)

14. Persons Contacted

*N. Wandke, Plant Superintendent
*L. Soth, Assistant Superintendent, Administration and Support Services
*C. Schuman, Assistant Superintendent, Operating
*W. Fuller, Personnel Administrator
*R. Ward, Senior Operating Engineer
*J. Marianyi, Technical Staff Supervisor
*S. Miller, Radiation Chemistry Supervisor
*F. Rescek, Lead Health Physicist
*L. Minejevs, Radiation Chemistry Foreman
*C. Schultz, Training Supervisor
*B. Harl, Quality Assurance Coordinator
*P. Kuhner, Quality Assurance Inspector
E. Murach, Assistant Superintendent, Maintenance
A. Mioshi, Master Instrument Mechanic
F. Tschakert, Instrument Foreman
N. Valos, Shift Engineer
M. Loucas, Shift Engineer
G. Harbin, Shift Engineer
G. Geer, Radwaste Coordinator
R. Lummis, Radwaste Foreman
R. Krueger, Radwaste Foreman
R. Dietz, Radwaste Foreman
T. Koleno, Redwaste Foreman
P. Drake, Stationman Foreman
S. Guranathan, Lead Chemist
P. Zwilling, Chemist
B. Schramer, Chemist
G. Trzyna, Health Physicist
F. Ost, Health Physicist
L. Lanes, Radiation Chemistry Foreman
M. Davis, Radiation Chemistry Foreman
J. Firoved, Engineering Assistant, Radiation Chemistry
R. Boyce, Engineering Assistant, Radiation Chemistry

M. Jedd, Engineering Assistant, Radiation Chemistry
F. Lentine, Assistant Technical Staff Supervisor
T. Hillmer, Radwaste Group Leader, Technical Staff
R. Rieck, Project/Licensing Group Leader, Technical Staff
R. Johnson, Thermal Group Leader, Technical Staff
W. Brasher, Technical Staff Engineer
J. Koske, Technical Staff Engineer
J. Wennerhall, Technical Staff Engineer
J. Walker, Training Instructor
S. Bass, Training Instructor
B. Westerman, Training Instructor
W. Cramer, Training Instructor

CECo Offsite

*F. Palmer, Manager, Nuclear Generation
*J. Bitel, Manager, Technical Services Nuclear
*R. Pavlick, Corporate Health Physicist
*L. Caldwell, Health Physicist
*W. Nestel, Station Nuclear Engineering Department
*G. Abrell, Manager Quality Assurance
J. Golden (telecon), Staff Radioecologist
P. Hayes (telecon), Nuclear Technician

Non CECo Employees

F. Bronson, Radiation Management Corporation
M. Anderson, Hittman Nuclear Development Corporation
T. Leveling, Hittman Nuclear Development Corporation
R. Hahn, Hittman Nuclear Development Corporation

*Denotes those present at the exit interview of March 21, 1980.

The inspectors also interviewed many other licensee employees and contractors during the inspection.