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

REGION III

Report No. 50-155/80-04

Docket No. 05000155 License No. DPR-6

Licensee: Consumers Power Company
212 West Michigan Avenue
Jackson, MI 49201

Facility Name: Big Rock Point Nuclear Power Plant

Inspection At: Big Rock Point Site, Charlevoix, MI

Inspection Conducted: March 3-14, 1980

Inspectors: L. R. Greger 5/30/80

E. H. Carbaugh 5/30/80

R. J. Greer 6/5/80

L. J. Hueter 6/4/80

G. Wehmann 5/30/80

Approved By: W. L. Fisher, Chief 6/4/80
Fuel Facility Projects and
Radiation Support Section

Inspection Summary

Inspection on March 3-14, 1980 (Report No. 50-155/80-04)
Areas Inspected: Special, announced inspection of health physics program, including organization and management, training, quality assurance, procedures, internal and external exposure controls, surveys and access controls, instrumentation, ALARA, radioactive waste, facilities and equipment, and accident response capabilities. The inspection involved 350 inspector-hours on site by five NRC inspectors.

Results: Several significant weaknesses in the health physics program were identified. These weaknesses are in the areas of staffing (Section 3), training (Sections 4 and 12), procedures (Section 6), radiological controls (Section 8), instrumentation (Section 9), ALARA (Section 10), and radwaste (Section 11). Two apparent items of noncompliance were found (infraction - inadquate offshift radiation protection coverage - Section 3; infraction - inadequate high radiation area access controls - Section 8).

DETAILS

1. Persons Contacted

R. Alexander, Shift Technical Advisor
*C. Axtell, Plant Health Physicist
H. Black, Maintenance Supervisor
R. Bichel, Quality Assurance Engineer
*T. Bordine, Quality Assurance Superintendent
K. Brooks, Senior Chemistry and Radiation Protection Technician
R. Burdette, Senior Chemistry and Radiation Protection Technician
*R. DeWitt, Vice President, Nuclear Operations (CPCo)
*R. Doan, Training Coordinator
G. Fox, Chemistry and Radiation Protection Supervisor
R. Garrett, Chemistry and Radiation Protection Technician
C. Hartman, Plant Superintendent
A. Kamrowski, Senior Chemistry and Radiation Protection Technician
T. Martens, Chemistry and Radiation Protection Technician
R. May, Shift Supervisor
B. O'Donnell, Shift Technical Advisor
*J. Popa, Maintenance Engineer
*A. Sevener, Operations Supervisor
*J. Rang, Operations and Maintenance Superintendent
C. Sonnenberg, Shift Supervisor
F. Valade, Shift Supervisor
S. VanderHeide, Senior Chemistry and Radiation Protection Technician
J. Warner, Chemistry and Radiation Protection Clerk/Secretary

The inspectors also contacted several other licensee employees, including members of the technical and engineering staffs.

*Denotes those attending the exit interview. In addition, Messrs. A. B. Davis, W. L. Fisher, and G. C. Wright from NRC Region III attended the exit interview.

2. General

This special appraisal, which began at 8:00 a.m. on March 4, 1980, was conducted to evaluate the adequacy and effectiveness of the licensee's overall health physics program. The Appraisal Team consisted of three inspectors from the NRC Region III office and two DOE contractor personnel. General tours and inspections of licensee facilities were conducted on March 4 and 5, 1980. Selected licensee facilities were examined in more detail during the remainder of the appraisal period. The scope of the appraisal included the health physics organization, management controls, qualifications and training of the health physics staff, training of radiation workers, the radiological protection program, radioactive waste processing and

effluent controls, and the analytical and counting laboratories. The licensee's past and anticipated future performance under both routine and abnormal conditions was evaluated.

Significant weaknesses were identified in several areas of the licensee's health physics program. These areas include: health physics professional and technical staffing levels, training for health physics technicians and radiation workers, definition of the health physics group's authority regarding radiological work activities, coverage of and adherence to health physics related procedures, personal contamination control instrumentation and practices, and implementation of a formalized, comprehensive ALARA program. Additional weaknesses are described in the respective report sections. The program weaknesses identified are expected to have a greater effect upon the licensee's ability to cope with anomalous radiological conditions, such as may be encountered during and subsequent to significant reactor accidents, than during routine operations. Therefore, the fact that the licensee's past health physics performance has been acceptable does not in itself provide adequate assurance that similar performance could be expected in significant offnormal situations.

3. Organization, Management, and Qualifications

Although the licensee's Chemistry and Radiation Protection organization appears to have performed its function adequately in the past, certain problems threaten its future performance under normal operating conditions and cast serious doubts concerning its ability to function adequately in offnormal situations. Principal among these problem areas are shortcomings regarding technical and professional staffing levels, offshift radiation protection coverage, and the Chemistry and Radiation Protection organization's authority over radiological hazards.

a. Organizational Structure

The licensee's onsite radiation protection organization is directed by the Plant Health Physicist, who reports directly to the Plant Superintendent. Radiological safety and chemistry functions are combined under the Plant Health Physicist and a single supervisor who directs the activities of the seven Chemistry and Radiation Protection (C&RP) technicians. The C&RP technicians are not members of a bargaining unit although operations and maintenance workers are. No significant problems were identified as resulting from the union/nonunion dichotomy. The C&RP technicians are on a rotating schedule (days only) between chemistry and radiation protection activities. The schedule typically results in technicians spending four weeks in one of the two areas before rotating to the other area. Individual technicians reported some difficulty refamiliarizing themselves

with required tasks, especially infrequently performed tasks. The C&RP Supervisor has apparently recognized this deficiency and discussed plans to assign continuing responsibilities for various tasks to individual technicians. Under this plan, the technicians would continue to rotate in job assignments but would retain responsibility for coordinating activities in one or more specific jobs. This plan should improve continuity of performance in the assigned areas. The licensee should also consider permanently assigning one or more technicians to chemistry and to radiation protection activities to take advantage of personal strengths of the technicians and to further increase continuity within these areas.

Offshift radiation protection coverage is provided by a combination of the onsite Shift Supervisor and on-call response by the C&RP technicians. Response time for the technicians is typically 30 minutes to one hour. Discussion with individual shift supervisors and the Plant Health Physicist revealed that the shift supervisors are not trained to perform airborne radiological evaluations and have limited capabilities regarding contamination evaluations. These tasks are normally performed by the on-call C&RP technicians. The licensee's policy regarding offshift radiation protection coverage does not appear to comply with the requirement of Technical Specification 10-6.2.2(d), which states that an individual qualified in radiation protection procedures shall be onsite when fuel is in the reactor. This requirement was further discussed in a letter from NRC (NRR) to the licensee dated March 15, 1977. The Shift Supervisors do not meet the criteria for the "individual qualified in radiation protection procedures" forwarded with the March 15, 1977 letter. Nor is it possible to utilize the Shift Supervisor in this capacity as such use would detract him from other plant operations requiring his attention in an emergency.

No specific problems were noted regarding the Plant Health Physicist's position in the plant organizational structure.

Based on the above findings, improved offshift radiation protection coverage is required to achieve a fully acceptable program. The individuals providing this coverage should not be assigned other duties which detract from their primary responsibility for radiation protection coverage. In addition, the following matter should be considered for improvement of this portion of the licensee's program: evaluate the methods for assigning work responsibilities within the C&RP Department with the goal of improving overall performance. Permanent assignment of one or more technicians to chemistry and to radiation protection activities should be considered.

b. Staffing and Qualifications

In addition to the Plant Health Physicist and the Chemistry and Radiation Protection Supervisor, seven technician and one clerk/secretary positions exist. One technician vacancy existed at the time of this appraisal. The technician staffing has been less than the full complement of seven approximately 25% of the time since the staffing was initially increased to seven in April 1977. A staffing shortage is apparent in the technician's workload. The current work schedule for the technicians includes three training days every five weeks. The intention of the training days is to allow the technicians time for self training, completion of required refamiliarization with infrequently performed tasks, etc. According to individual technicians, however, time for such training has been virtually nonexistent. The Chemistry and Radiation Protection Supervisor acknowledged that technician staffing deficiencies and required workload have dictated that the alloted training days be used for work activities routinely instead of for training. The technician staffing problems may be exacerbated in the near future by the loss of additional technicians due to uncertainty ove the continued operation of the plant. The Appraisal Team considers this to be a serious problem. The adequacy of C&RP technician staffing, even if at full complement, is questionable given the current workload. Shift radiation protection coverage needs and potential C&RP technician losses forebodes increased staffing problems that require the licensee's immediate and concerted attention. Technicians have been obtained from two other nuclear plants within the utility to supplement the plant's C&RP technicians during major outages in the past. However, there is no established program to routinely cross train technicians between the plants to provide a ready pool of available manpower. Nor are the plant's radiation protection programs standardized to ease the transition of personnel from one plant to the other.

Workload problems appear to exist on the supervisory level also. The C&RP Supervisor has an extremely heavy workload which has limited his involvement in certain aspects of his job, including C&RP technician training as noted in Section 4.a of this report. This workload may be eased somewhat by the assignment of responsibilities to the Senior C&RP Technicians, but the Appraisal Team feels strongly that there is a need for additional professional position(s) within the Chemistry and Radiation Protection group to adequately implement the health physics program. The individual(s) should have an educational background (but not necessarily the experience) sufficient to meet the Radiation Protection Manager qualifications of Regulatory Guide 1.8. In addition to easing the C&RP Supervisor's workload, the additional individual(s) should be capable of providing backup for the Plant Health

Physicist as working experience is gained. On an interim basis, backup support for the Plant Health Physicist should be provided as noted in Section 3.e of this report.

Review of the qualifications of the C&RP personnel revealed the following problems. (1) One technician, assigned to work the weekend day shifts since September 1979 as the sole onsite C&RP representative, does not meet the experience requirements of ANSI N18.1-1971. (2) The same technician had not completed the practical factors specified in Chapter Three of the Plant Master Training Manual for completion prior to assignment of a technician to the rotating schedule. (3) The C&RP Supervisor had not been formally upgraded to a Level III certification as required in Appendix A of the Plant Master Training Manual. The C&RP Supervisor was promoted from a Senior C&RP Technician in November 1979, upon departure of the previous C&RP Supervisor.

Based on the above findings, improved C&RP technician and professional staffing is required to achieve a fully acceptable program. Staffing must be sufficient to allow for adequate performance of assigned responsibilities under routine and anticipated nonroutine conditions, to allow for adequate training within the C&RP Department, and to provide reasonable assurance that personnel loss will not adversely affect conduct of essential C&RP functions. In addition, the licensee must ensure that staffing assignments are consistent with regulatory and procedural requirements.

c. Authority

The general attitude of plant personnel regarding radiation protection appears positive. There apparently are individuals, however, who regard radiation protection activities as only a nuisance to be tolerated, and there are isolated radiation protection practices which are ignored by significant numbers of individuals (e.g., frisking). Such occurrences are not totally unexpected but must be dealt with firmly to prevent a loss of credibility of the radiation protection program. According to C&RP personnel, these problems are not routinely resolved satisfactorily. An informal C&RP reporting system devised to record and to prompt corrective action in cases of minor infractions of radiation protection rules is no longer utilized by the C&RP technicians, reportedly due to the lack of discernible corrective actions. The system was described as a "waste of time" by individual C&RP technicians who claimed to have seen little or no corrective actions resulting from their efforts. This undesirable situation is worsened by the belief of the C&RP technicians and their supervisors that the technicians do not have the authority to force workers to follow their instructions directly

but must, in cases of conflict, work up through the C&RP supervision chain, over to the supervision of the affected group, and back down to the worker. Certain workers reportedly take advantage of this situation thereby hindering the performance of C&RP technicians. The Appraisal Team feels that the C&RP technicians must have the immediate authority to implement radiological controls over plant personnel. In case of disagreement, C&RP technician instructions should be followed and the conflict resolved later or the worker should leave the area of immediate radiological hazard until the matter is resolved. Such an arrangement, of necessity, requires well trained C&RP technicians who must be responsible for their actions.

Discussions with the Plant Superintendent revealed that he was of the belief that the C&RP technicians did have the authority to enforce radiological requirements. The Plant Health Physicist and the C&RP Supervisor, however, were of the belief that the C&RP technicians could only advise workers regarding radiological controls and that the workers were well aware of this role. The Appraisal Team considers this matter to require immediate resolution. Plant management must clearly define the responsibilities and authority of the C&RP technicians and must vigorously enforce compliance with radiological safety requirements.

Based on the above findings, improvements in the following areas are required to achieve a fully acceptable program. (1) All plant personnel should be well aware of the role and authority of the C&RP technicians over radiological matters. (2) Infractions of radiological safety rules should be addressed consistently, appropriately, and timely. (3) There should be ample feedback to communicate the management resolution of these matters to the C&RP personnel.

d. Communications/Performance

Communications within the Chemistry and Radiation Protection organization appears good. Individual technicians appeared well informed regarding departmental matters and plant radiological conditions. The C&RP supervision also appeared well versed in the problems experienced by the C&RP technicians in implementing the radiological safety effort. The Plant Superintendent, however, did not appear to be familiar with the C&RP technicians' concerns. The Appraisal Team feels that significant concerns of the C&RP technicians should be known by the highest level of plant management.

One tool for communicating problems encountered by the C&RP technicians is through the post-monitoring evaluation form.

According to Procedure RP-33, this form is to be completed following every monitoring assignment. Information on the form appeared quite useful, but can be time consuming to complete. Apparently only about six post-monitoring evaluation forms per year were completed over the past few years. The Appraisal Team recognizes the effort imposed by the evaluation form but strongly recommends its continued use.

The Plant Health Physicist and the C&RP Supervisor have been in the C&RP Group since plant startup in 1962. The familiarity with the plant gained over this time appears to contribute positively toward administration of the radiation safety program. The six C&RP technicians have about 23 years combined experience at the plant. There has been considerable turnover of technician personnel in the last three years. It appears that uncertainties over continued plant operation may lead to the loss of additional C&RP technicians in the near future. The Appraisal Team feels that the C&RP group has been able to cope with the turnover problem in the past largely because of the continuity provided by a few experienced members of the group. As noted in Section 3.b, this matter warrants the licensee's attention to ensure that future personnel losses do not cause abnormally large perturbations in the conduct of the Radiation Protection Program.

Based on the above findings, this portion of the licensee's program appears to be acceptable but the following matters should be considered for improvement. (1) Communication channels between plant management and C&RP personnel should be improved. (2) Use of the Post Monitoring Evaluation Form, or a similar source of information, should be reinforced.

e. Corporate Support

Corporate support for the plant C&RP organzation appears to have been responsive to plant requests to date in the areas of budget, technical assistance, and emergency planning. Increased emphasis in the areas of instrumentation and emergency planning has been particularly evident since Three Mile Island. One weakness observed in the area of corporate support is the lengthy (1-2 month) turnaround time between TLD changeout and reporting results to the site. (For further discussion on TLD turnaround, see Secion 7 of this report).

The corporate health physics organization is a staff function to the corporate office and a service organization to the plant. It holds no direct responsibility or authority over the Big Rock Point Plant. It does, however, handle the external dosimetry program for all Consumers Power nuclear plants, including procurement and readout of TLDs, reporting of exposures to the

plants, and notifications to individuals. It also prepares the routine effluent reports for the Nuclear Regulatory Commission, and since Three Mile Island, has taken the lead in developing emergency plans and coordinating with state agencies. The corporate health physics organization also provides technical assistance and has participated in several technical audits of the site C&RP program.

Consideration has been given to the involvement of the corporate health physics organization in the training of health physics technicians at the three nuclear plants. The Appraisal Team believes there is some merit to providing generic type training to the C&RP technicians by the corporate organization. Such training should be of particular value since interplant borrowing of technicians occurs during outages. Such training should not be construed as an acceptable substitute for plant specific training.

The relatively small health physics management staffing at the plant poses special problems of availability of professional health physics expertise during periods of extended absence of the Plant Health Physicist. The Appraisal Team believes that consideration should be given to providing backup professional expertise from the corporate organization during periods of extended absence of the Plant Health Physicist. Such backup expertise should be mandatory in case of simultaneous absence of both the Plant Health Physicist and the C&RP Supervisor. The licensee does not have specific contingency plans providing for such backup coverage at present. As noted in Section 3, the addition of another professional to the plant health physics staff could alleviate this problem.

Based on the above findings, this portion of the licensee's program appears to be acceptable; however, the following matter should be considered for improvement. Professional health physics expertise should be made available to the plant under certain circumstances of absence of plant personnel.

4. Training

The licensee's training program includes initial training and retraining in radiological safety for general workers and specific work groups. With some minor exceptions, initial radiological training provided per 10 CFR 19.12 appeared adequate. The radiological training provided specific work groups, however, was not fully acceptable in all cases. The Appraisal Team's opinion is that the licensee's training effort in radiological safety matters requires significant improvement.

a. C&RP Personnel Training

New C&RP technicians attend a videotaped orientation and chemistry and radiation protection course shortly after arrival at the plant. This training is followed by on-the-job training by way of prescribed practical factors for technician and senior technician positions. The practical factor program is also used at specified intervals for retraining. According to licensee personnel, additional planned training/retraining includes: monthly safety meetings; six day and eleven day chemistry and radiation protection courses, respectively, given by the Plant Health Physicist; a plant systems course; biennial RWP-exempt retraining; and self study during the assigned three day (every five weeks) training shift. In reality much of this training/retraining has not been implemented. Only three "monthly" safety meetings were held in 1979 and 1980, through 3/4/80. The eleven day radiation protection course has not been given for at least the preceding three years; five of the six current technicians have not received the course. A plant systems course was recently initiated but consists of only two hours class time per month and no additional out-of-class assignments. The biennial RWP-exempt retraining consists solely of an open book test, which, although most recently given in January 1980, had not been returned to show incorrect responses as of 3/4/80. As noted in Section 3.b, the three day training shift has only rarely been used for self study or training. It was noted that no special training has been conducted regarding reaction of the C&RP technicians to special health physics problems associated with a TMI-type accident, except for use of instrumentation and sampling installed in response to NUREG-0578. Discussion with individual C&RP technicians revealed significant dissatisfaction with the lack of meaningful training at the plant. A problem resulting from insufficient chemistry laboratory training is described in Section 12 of this report. One of the reasons for the poor training effort within the C&RP group appears to be the low ratio of staffing (on both professional and technical levels) to workload. The Plant Health Physicist did indicate that he had plans for conducting training regarding health physics aspects of the TMI accident and the eleven and six day radiation protection/chemistry courses in the near future. Although the Plant Health Physicist indicated that he recieved ample opportunity to attend outside training courses, the C&RP Supervisor should also be encouraged to participate in professional training courses.

Based on the above findings, upgrading of the technical training provided C&RP technicians is required to achieve a fully acceptable program in this area.

b. RWP-Exempt Training

Over one half of the plant personnel are exempt from the requirements for a radiation work permit for entry and work (including opening systems) in the radiation controlled plant areas. By virtue of their training these workers are allowed to provide for their own radiation protection. The Appraisal Team has serious reservations regarding the adequacy of the training received by RWP-exempt personnel. (See Section 8(b) for additional concerns regarding the RWP-exempt program.)

The following training related problems with the RWP-exempt program were specifically noted. (1) The only requirement for requalification (biennial) is to receive a score of 70% on a relatively simple open book test. (2) The C&RP group has no involvement in requalifications and minimal involvemnt in initial qualifications. (3) Although problems indicative of substandard radiation safety activities occur, seldom are corrective actions (e.g., retraining/revocation of RWP-exempt status) vigorously applied. An incident occurred early last year in which three RWP-exempt individuals received unwarranted radiation exposures from two high level radiation sources which were not properly identified. A training lesson was developed as a result of the incident but the training was not completed until approximately one year after the event (after being prodded by the NRC to complete the training).

Based on the above findings, upgrading of the training provided RWP-exempt workers or revision of the RWP-exempt program to eliminate the need for improved training is required to achieve a fully acceptable program.

c. 10 CFR 19.12 Training

With the exception of the following two items, no significant problems were identified regarding instructions to workers per 10 CFR 19.12.

The two items requiring licensee attention are instructions to escorted visitors and instructions to "experienced" individuals receiving abbreviated radiation protection training. The licensee allows personnel who enter radiation controlled areas for no more than eight hours, and who are under continuous escort, to enter the plant without receiving orientation training. These individuals should be given certain minimum instructions to apprise them of radiological hazards, their responsibilities for complying with their escort's instructions, and the authorities and responsibilities of the NRC and plant for radiological safety. This instruction could be in the form of a written handout given the escorted visitor upon arrival at the plant. The

second item pertains to the orientation training given to workers who are relatively familiar with basic radiation protection practices due to specialized training, experience, etc. These individuals are given a written test in radiation safety practices in addition to a brief nonradiological safety presentation. They should also be given a brief radiation protection orientation especially aimed at those radiological safety practices which are specific to the Big Rock Point Plant. It is recognized that certain workers possess adequate general radiation safety knowledge to comply with portions of the instructional requirements of 10 CFR 19.11. It is not the Appraisal Team's intent to recommend retraining of these individuals in general radiation safety matters, only to briefly instruct them in radiation safety practices peculiar to the plant.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but the following matters should be considered for improvement. The training provided escorted visitors and "experienced" radiation workers should be revised to include additional instructional information.

d. Other Training

By virtue of their work, maintenance personnel are exposed to significant radiological hazards, more so than any other group of workers with the possible exception of C&RP personnel. Although these workers are not RWP-exempt and therefore receive job specific radiological safety guidance from the C&RP technicians, they receive very little formal radiological safety instruction. The Appraisal Team is of the opinion that such training is essential to the conduct of meaningful radiological protection. Workers should understand the basic rationale for radiological safety instructions to enhance their cooperation with the C&RP group and to allow for those occasions when the worker must make his own decision regarding a possible radiological hazard. Prior to last year (1979), essentially no refresher radiological safety training was received by maintenance workers. A four hour (annual) training session was held in 1980 and is expected to be conducted annually in the future. This training requirement should be expanded as necessary to ensure proper understanding of basic radiological safety considerations by maintenance personnel

Contract health physics support for outages has not been used for the last several years. Technicians from other plants within the licensee's organization have been brought in for recent outages. The licensee's current plans are to continue in this manner. These individuals are not subjected to a formal C&RP technician training program but adequate controls appear to be exercised over them to ensure that they can perform their assigned tasks. These controls are enhanced by the continuity of personnel existent in this program.

Several plant employees, shift supervisors, and shift technical advisors were questioned regarding their ability to use a relatively new procedure for quantification of abnormally high airborne radioactive effluents. All of the individuals had supposedly attended a training session in use of the new procedure within the previous two months and each was in a position of being required to use the procedure in an accident situation. Knowledge of the subject ranged from ignorance that such a procedure existed to good working knowledge of the quantification technique. The training provided in this instance apparently was not entirely adequate to ensure that the responsible individuals could perform their required actions. It is not intended to condemn the entire training program based on this one finding. It does, however, raise enough doubt to warrant serious review on the part of training personnel and licensee management. A problem regarding accessibility of the effluent quantification procedure is discussed in Section 6.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but the following items should be considered for improvement in this area. (1) The radiological safety training provided maintenance personnel should be upgraded. (2) The reason for the wide range of knowledge of high airborne radioactive effluent quantification techniques should be determined and corrective measures taken to resolve any generic training problems identified.

5. Quality Assurance

Quality assurance is applied to the health physics program on three levels. Technical audits are performed by the corporate health physics organization; routine audits and surveillances are performed by the onsite QA organization; and quality assurance activities, both formal and informal, are built into various aspects of the routine health physics program. The corporate technical audits appeared to be acceptable. Needed improvements were noted, however, in the plant QA organization efforts and the quality assurance practiced within the health physics (C&RP) organization.

The onsite Quality Assurance group performs surveillance on the C&RP Program for adherence to procedural requirements. Additionally Q-List related procurement activities and design changes are subject to Q.A. review. The Big Rock Point Q-List is contained in Volume 17 of the Plant Manual; those items pertaining to C&RP are as follows: (1) calculations and tests to verify chemical parameters of operating and standby fluid systems, (2) calculations and tests related to development of the Site Emergency Plan, (3) calculation methods and tests related to personal radiation dose, and (4) calculations and tests related to discharge of radioactive material. These Q-items require full compliance with the Corporate QA Manual. In addition,

a mini QA program has been defined in Procedure QAPP 2-57 to comply with the 10 CFR 71 requirements for shipping of greater than Type A quantities of radioactive material. Consideration is being given by the plant to add such shipments to the Q-List to eliminate confusion resulting from partial as opposed to full QA Manual applicability.

The on-site QA group does not routinely review C&RP procedures. Since C&RP Department procedures cover such items as personnel dosimetry and dose rate instrument use and calibration, it would appear that such C&RP Department procedures fall under the Plant Q-List item for "calculation methods and tests related to personnel radiation dose." The Appraisal Team believes expanded QA participation in the C&RP program is warranted, particularly in the areas of contamination detection, dosimetry control, and training. Past QA involvement with C&RP apparently has been somewhat hampered by a lack of QA personnel knowledgeable in both plant operations and health physics. This situation appears to now be improving with the addition of a QA general engineer for C&RP interfaces having both plant experience and nuclear engineering background.

In 1979, technical audits or surveillances were performed on radiation and contamination surveys, environmental surveillance, effluent monitoring, and plant chemistry and radiochemistry. A January 1980 surveillance on radwaste shipping prompted C&RP to request a more in depth technical audit. This audit was in process during the last week the Appraisal Team was onsite. A surveillance on radiation protection training is planned for April.

Although internal C&RP Department audit activities are conducted, there is no formal requirement for them. Internal audits can be a very effective tool for assuring the quality of the program; it is recommended that a formal plan for their performance be established. It was noted that the planned establishment of specialty areas within the C&RP Department and lead technicians responsible for those areas should lend further assurance to the quality of the C&RP program.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but the following items should be considered for improvement in this area. (1) The onsite Q.A. organization should expand their surveillance activities related to C&RP Department, especially in the area of procedure review. (2) The licensee should consider formalizing Q.A. activities conducted within the C&RP Department.

6. Procedures

Radiation protection program procedures are contained primarily in Volume 11 (Radiation Protection Manual-General) and Volume 12 (Radiation Protection-Departmental) of the Big Rock Point Manual. Individual procedures were reviewed as they pertained to areas examined

during this appraisal. Additionally, the licensee's review and approval system for procedures, including revisions, was examined. Although the licensee's procedures are generally acceptable, sufficient problems were identified to suggest the need for additional licensee attention in this area.

One problem area identified was the need for procedure additions or revisions to include functions not presently covered. This area includes items such as: calibration and use procedures for contamination detection instrumentation (Section 9.c), effluent monitor fluid calibrations (Section 9.h), requirements for ALARA reviews (Section 10), and pencil dosimeter quality assurance requirements (Section 7). These comments are detailed in the referenced sections of this report. Also, additional development of procedures regarding inplant C&RP accident response and recovery is needed. As noted in Section 13, development of these procedures is expected to be completed during May 1980.

A second problem area identified was the failure to follow existing procedures. This problem can arise from a laxity in enforcement of adherence to procedures or the failure to effect revisions to procedures to keep them current. This area includes items such as: the assignment of a C&RP technician to weekend coverage without completing the prerequisite practical factor training (Section 3.b), the assignment of an individual as C&RP Supervisor without upgrading the individual to a Level III inspection certification (Section 3.b), and failure to complete post monitoring evaluation forms following radiological monitoring assignments (Section 3.d).

A third problem area identified was a need for minor changes to clarify terminology or to resolve inconsistencies in the procedures. The following items were noted in this regard. Double stepoff boundaries are specified in Radiation Protection Manual, Section 11.9.3 for use with "grossly contaminated areas" but no quantitative guidance is given to clarify the terminology "grossly contaminated areas." The term "general radiation field" is integral to the definition of a high radiation area (Radiation Protection Manual, Section 11.9.3) but is not defined. As noted in Section 8(d), this lack of clear definition may lead to problems complying with regulatory requirements for high radiation area control. Radiation protection procedure RP-30 refers to "hot spot" posting but no clarification of conditions warranting such posting is presented. Section 11.8.2 of the Radiation Protection Manual refers to a portal monitor in the plant lobby even though this monitor was removed in 1978. Procedure clarity and accuracy are important to a successful program. Clarity is necessary to achieve uniform interpretation; accuracy is necessary to instill confidence in procedure use.

A problem was noted in Section 4(d) of this report regarding use of a new procedure for quantifying certain anomalous airborne radioactive

releases. Several licensee personnnel experienced difficulty in locating the procedure when queried during this appraisal. One reason for this difficulty was that the procedure, which is included as an annex to the licensee's emergency plan, was not referenced in the procedures routinely used for offnormal events (i.e., plant alarm procedures, plant operating procedures, emergency director actions section of emergency plan).

Based on the above findings, improvements in the scope of procedural coverage and adherence to established procedures are required to achieve a fully acceptable program in this area. In addition, existing C&RP procedures should be reviewed to resolve the noted inconsistencies and clarification needs.

7. Exposure Controls

The licensee's external and internal exposure control programs have apparently functioned adequately in the past as evidenced by the paucity of specific exposure problems. However, several areas for improvement were identified during this review.

a. External Exposure Control

External radiation exposures are monitored by a combination of thermoluminescent and pencil dosimeters. The thermoluminescent dosimeters (TLD) are used to determine workers' official doses: pencil dosimeters are used to monitor and control exposures on a short term basis. The licensee's program includes administrative methods designed to preclude overexposures and to assure the quality of the program. Minor problems, noted below, were identified in several areas of the licensee's external exposure control program.

Quarterly Exposure Cards provide the working dosimetry record for individuals. Pencil dosimeter readouts and rezeroings are recorded on these cards; the cards are updated with TLD data when available. An Accumulated Radiation Exposure Summary is prepared weekly (daily during outages) from the Quarterly Exposure Cards. This summary indicates dose received to date for the quarter, the administrative limit, and any other information deemed pertinent by C&RP.

The summary is distributed to BRP department managers and a copy is posted at the C&RP office. While department managers are responsible for distributing exposure evenly among department workers beyond 1000 mrems per quarter, and administrative limits (1100 and 2400 mrems) are established to preclude exceeding quarterly regulatory exposure limits, the responsibility for limiting exposures appears to rest primarily with the individual until regulatory limits are approached. Exposure control problems noted include: (1) short term exposure control limits are

not used; (2) exposure histories supplied by workers on NRC-4's are not routinely verified; (3) documentation is not maintained to record authorizations to exceed the 2400 mrems administrative limit; and (4) pencil dosimeters are read and rezeroed weekly, or less frequently, upon request by the individual worker instead of at C&RP insistence. (However, guidelines do specify that pencil dosimeters should be read and rezeroed when they reach 3/4 full scale).

The TLD program is conducted by the corporate health physics group. Beta-gamma dosimetry is performed using $CaSO_4$ TLD's. Neutron dosimetry is provided by a LiF albedo neutron TLD. Quantities of both TLD's and pencil dosimeters appeared adequate. Approximately 150 TLD's are assigned to plant personnel with an extra 100 for plant staff, 100 for plant visitors, and 30 albedo neutron TLD dosimeters for special neutron exposure situations according to licensee personnel. The Consumers Power corporate office in Jackson can provide next day delivery of additional dosimeters if necessary. Spare TLD's are stored in a rack in the C&RP office. Control dosimeters are also stored with the spares. TLD finger rings are also available. The site has approximately 110 pencil dosimeters (0-200 mR) which are routinely issued. An additional 100 are available as spares. High range pencil dosimeters (0-1R and 0-5R) are also available.

Plant personnel are assigned both TLD and pencil dosimeter personal monitoring devices except for plant guards and administrative personnel who are only given TLD's. A potential problem was noted regarding storage of personal monitoring devices. Although the majority of workers use a dosimeter storage rack located near the access control point, some personnel (quality assurance, engineering, and guards) routinely store their dosimeters in their offices. Control dosimeters are located at the dosimeter storage rack but not at these other dosimeter storage locations. This could cause problems in determining personal exposures versus badge exposures, especially in accident situations.

Computerized record keeping is being developed by the corporate health physics group to maintain the permanent personal exposure records. This system has not been fully debugged; the permanent exposure records are presently maintained by the plant C&RP group. One problem noted with the corporate program was the rather lengthy turnaround time (one to two months) for return of exposure results to the plant. The plant expects to initiate a separate TLD dosimetry system, with onsite readout, in the near future. The details for utilizing this system have not yet been resolved.

Methods of assuring the quality of the licensee's external dosimetry program include: (1) participation in the University of Michigan Personal Dosimetry Performance Testing study: (2) submittal of several spiked TLD's to the corporate office with each TLD batch; (3) comparison of TLD results and inplant neutron dose rate measurements; and (4) comparison of TLD and pencil dosimeter readings. The University of Michigan study results have been very good for pure gamma exposures with greater variations in mixed fields (gamma and beta or neutron). Several large errors were apparently traced to an instrumentation malfunction which reportedly has been corrected, a conservative error resulted. A problem encountered while comparing albedo neutron TLD response with neutron dose rate measurements has not been completely resolved but the error, if it exists, is conservative. One problem noted was the lack of routine calibration and drift checks of the pencil dosimeters. Regulatory Guide 8.4 recommends that these checks be performed semiannually for supplemental dosimetry systems. Plant procedure RIP-16 "Accuracy Check of Personnel Dosimeters" describes the procedure for performing these checks, but does not specify a frequency.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but the following matters should be considered for improvement: (1) establishment of a program for routine calibration/response and drift checks of pencil dosimeters; (2) evaluation of dosimetry storage and pencil dosimeter readout practices; (3) maintenance of documentation to support personal exposure authorizations in excess of administrative limits; (4) review of the adequacy of the turnaround time for corporate TLD readout; (5) establishment of short term exposure control limits; and (6) verification of exposure histories for individuals exposed to greater than 1.25 rems per quarter whole body dose.

b. Internal Exposure Control

The licensee controls internal exposures through the use of: (1) engineering controls to minimize airborne radioactivity in occupiable areas, (2) an air sampling program to evaluate airborne radioactivity levels, (3) approved respiratory equipment to limit the intake of airborne radioactivity if required by airborne concentrations, and (4) whole body counting to evaluate the effectiveness of the overall program for limiting the intake of radioactivity.

Routine particulate high volume air samples include: one sample daily in the containment sphere on the 585-foot elevation during reactor operation; twelve weekly samples, including one on the reactor deck during reactor operation (the latter is performed daily during outages); and fourteen monthly samples. The routine

air sampling program includes iodine and alpha determinations conducted weekly during reactor operation and daily during outages. In addition, job specific high volume air samples are collected and analyzed before work begins and at approximate two hour intervals during work in airborne or potential airborne areas. Review of the air sample analyses for the last six months of 1979 and first two months of 1980 showed no significant alpha or iodine activity. Gamma activity, although generally less than 1 MPC, exceeded 1 MPC occasionally. The highest concentration noted was about 20 MPC on the reactor deck on 10/22/79. This airborne activity was attributable to a wetted down contaminated object drying out before the planned work was finished. Respiratory protection equipment providing a protection factor of 50 was being worn at the time.

The licensee provides NIOSH approved respiratory protective equipment and a program for inspecting, cleaning, disinfecting, surveying, storing, and maintaining the equipment. Respiratory protective equipment on hand included: 24 half mask respirators of two types (all at access control); 48 full face respirators of two types (31 at access control, the remainder at a stockroom in a separate building southwest of the plant); about 10 new self contained breathing apparatus (SCBA) each having 60 minutes capacity (located at various places in and around the plant for use in both fire fighting and radiological protection); 6 full face air line respirators (all located in the stock room); 17 hood or helmet assemblies (12 located at the turbine deck, the remainder in the stock room); and 3 rain suits (located in the stock room). Appropriate protection factors are assigned to respiratory protection equipment usage. Respirator fit testing is conducted before initial entry into airborne areas requiring respiratory protection and at annual intervals thereafter in accordance with plant procedures. A qualitative fit testing method is used. The licensee has no facility for conducting quantitative fit testing.

Medical evaluations of respirator users are performed at annual intervals per regulatory requirements. A problem regarding medical evaluations was identified and corrected by the licensee during 1979. The medical qualification list, generated by the plant Personnel Department, incorrectly identified several individuals as having successfully completed the medical evaluation. The problem arose because of a lack of specific communications from the medical consultant upon completion of the evaluation. Specific confirmation of the satisfactory completion of the medical evaluation is now required. A second problem regarding medical qualifications was identified by the Appraisal Team. The licensee apparently failed to consult the medical qualification list before issuance of a respiratory protective device to an individual recently. Although the

MPC-hours log showed that the individual had worn respiratory protective devices on three different occasions in mid-February 1980, the medical qualification list showed that the individual was last medically approved to wear respiratory equipment in mid-January 1979. It was subsequently discovered that the individual had completed a medical requalification in 1980 but was mistakenly omitted from the medical qualification list. Licensee personnel should ensure that the medical qualification list is current and is used.

The licensee utilizes a whole body counter to evaluate the effectiveness of the internal exposure control program. Counts are conducted of incoming workers who have worked at other nuclear facilities, or workers who have been involved in occurrences with the potential for significant uptake of radioactivity, and of workers upon termination of employment. Routine whole body counts are conducted semiannually for workers frequenting potential airborne areas and annually for other plant personnel. No problems were identified in the licensee's procedure for evaluation of whole body counting results. Whole body counts for about 330 individuals over the thirteen month period from January 1, 1979, through January 30, 1980, were reviewed; no evidence was found to indicate that controls were ineffective in limiting intake of radioactive material to the 40 MPC-hour control measure. Review of the licensee's MPC-hours log did not reveal any problems.

Based on the above findings, this portion of the licensee's program appears to be acceptable. Increased attention, however, should be directed to assuring the accuracy and use of the medical qualification list.

8. Surveillance and Access Control

The licensee's radiological control program was examined, including: (1) the routine radiation survey program, (2) the radiation work permit (RWP) program, (3) monitoring practices for routine and specific operations, (4) access controls, and (5) the ability of the C&RP Department to implement procedures and perform under emergency conditions. The access control review included : (1) restricted areas, (2) radiation areas, (3) high radiation areas, and (4) contamination areas.

a. Routine Surveys

The general procedures governing routine surveys at the Big Rock Point Plant are covered in Chapter 13 of the plant Radiation Protection Manual. Specific survey instructions are contained in Procedure RP-29, "Radiological Survey." Routine surveys (daily, weekly, monthly) consist of direct radiation measurements taken at about three feet above the floor at specified

locations, smear samples from the floor in the same general location, and air sampling (particulate and, when warranted, iodine). Area radiation/contamination signs and status sheets are normally updated weekly, or sooner if conditions warrant. The results of all surveys are reviewed by the C&RP Supervisor and the reports filed in the Health Physics Office. No problems with the conduct of the surveys were noted.

Area status sheets are posted at the entrance to radiation and contamination areas. The status sheets identify the radiation dose rate, contamination, and airborne radioactivity levels from the most recent survey. In addition, the radiation protection requirements needed for entry into the posted area are provided. However, the protective clothing requirements do not differentiate between the various work activities which may be conducted within the area.

One area which would benefit from closer control by the C&RP group is the laundry facility. Although acceptance criteria exist for laundered clothing radiation levels, the C&RP group does not routinely survey any clothing. This function is performed by plant janitors, who possess only minimal radiation protection skills. Radiation measurements made during this appraisal revealed radiation levels up to 5 mR/hr in laundered clothing bins and in excess of 0.5 mR/hr from single articles of laundered clothing.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but the following matters should be considered for improvement of the program: (1) inclusion of laundered clothing in the routine survey program; (2) clearer definition of protective clothing requirements for entries into posted areas for activities other than hands-on work.

b. Radiation Work Permits

Personnel who are not specifically authorized for exemption (RWP-exempt) must obtain a radiation work permit (RWP) to work in a radiologically posted area unless accompanied by a C&RP technician. Radiation work permits are not used very extensively; only 26 job specific RWP's and 12 extended RWP's were utilized in 1979. The majority of the work performed within posted areas is either under the supervision of a C&RP technician or involves RWP-exempt personnel. Approximately 60% of the plant workers are presently RWP-exempt. Training problems associated with the RWP-exempt program are identified in Section 4(b). In addition to the training problems, the following criticisms of the licensee's RWP-exempt program were noted. (1) According to plant procedures (Volume 11.2.20) violations of

radiation protection procedures may be cause for losing the RWP-exemption. However, the Plant Health Phsycist reported that although radiation protection procedures have been violated, to his knowledge no employee has lost his RWP-exempt status. (2) Plant procedures (Volume 11.2.20) specify that RWP-exempt employees will be reviewed quarterly by the Health Physics Department. No criteria for such review were found nor were there records to indicate that reviews were conducted. (3) Workers are not free to consider radiation protection matters primarily, as are the C&RP technicians. Since the worker's primary purpose is to perform an assigned task, radiation safety matters are easily relegated to an inferior position. (4) Certain RWP-exempt workers only infrequently enter the radiation controlled plant areas. In addition to other problems previously mentioned, these workers are likely to lack the familiarity with plant radiological conditions and radiological safety practices necessary to adequately provide for their radiological safety. (5) Changes in radiation protection procedures had not been directed to all RWP-exempt personnel. Action to correct this matter was initiated by the licensee during the appraisal. (6) Opening of systems by RWP-exempt individuals may create radiological hazards which have not been previously evaluated by C&RP personnel.

Based on the above findings, improvements in the conduct of the RWP-exempt program are required to achieve a fully acceptable program.

c. Monitoring Practices

Radiation protection monitoring practices for routine and specific operations were reviewed. As part of this review, C&RP technicians were observed monitoring several minor repair jobs in posted areas. The monitoring practices observed generally appeared adequate and in accordance with established procedures. One minor problem was noted in that a C&RP technician was observed to remain in the immediate area of a work assignment after completing the initial radiation survey. The dose rate near the work area was approximately 6 mR/hr but was less than 1 mR/hr six to eight feet away. The technician could have observed the ALARA philosophy more rigorously by performing the initial survey and then removing himself to the lower background area.

A problem was also noted with the use of personnel friskers. Eight personnel frisking stations are located throughout the plant. There were a number of occasions when the appraiser observed individuals passing these stations without monitoring themselves. Other problems observed were: (1) Frisker ratemeters were observed on several occasions to be switched to an unnecessarily high range. (2) Noise levels in the vicinity of

two frisking stations were excessive to the point of obscuring the frisker audible alarm. (3) Frisker sensitivities varied over a wide range, with no postings to warn of the variations. The access control frisker was the most sensitive, but was routinely bypassed by workers after passing through a relatively insensitive waist high portal monitor. (See Section 9 for additional details regarding frisker efficiencies and portal monitors). Workers are not required to enter and exit the plant controlled (radiological) areas via access control. According to guardhouse personnel, it is not uncommon for workers to cause the guardhouse portal monitor to alarm upon exit from the plant. As noted in Section 9, the guardhouse portal monitor requires a minimum of approximately 15,000 dpm shoe contamination, the most sensitive location because of geometry considerations, to initiate an alarm. If a worker fails to successfully pass through the portal monitor after three attempts, he must return to the plant to resolve the problem. Documented reports of personnel contamination (forty-six in 1979) were reviewed.

Based on the above findings, improvement in personal contamination monitoring is required to achieve a fully acceptable program.

d. Access Controls

The restricted area is defined as the area of the site enclosed by the security fence. Routine access to the restricted area is through the constantly manned guardhouse. The guardforce is responsible for ensuring that personnel are authorized site access and that the portal radiation monitor is used upon exiting the restricted area. No problems were noted with the restricted area access controls.

Radiation area control is provided through area postings and special access requirements. Postings were generally good, however, an area surrounding three drums used for temporary disposal and storage of spent liquid radwaste filters was noted to be inappropriately posted during the appraisal. A radiation area sign was hung from a radiation rope strung around the drums. Although radiation levels of up to 30 mR/hr were measured at the rope on March 8 and 11, 1980, the posting stated that the radiation level was 5 mR/hr. The posting was apparently not revised as additional spent filters were added to the drums. It was also noted that several areas, including the off gas sampling area, were not posted at the boundary of the radiation area but were instead posted at a point within the area.

High radiation area access is typically controlled by locking with the keys under the administrative control of the shift supervisor. A log is maintained to record high radiation area entries. Six high radiation areas existed at the time of this

appraisal. Several problems were identified with the high radiation area controls. (1) The condensate demineralizer area contained radiation levels up to 600 mR/hr contact and 200 mR/hr at 18 inches, according to measurements made by licensee personnel at the request of the appraisers, but the area was not locked. A single chain restricted access to the area. (2) The turbine moisture separator measured up to 450 mR/hr contact and 180 mR/hr at 18 inches according to measurements made by licensee personnel. The area was posted as a high radiation area but was not locked or roped off. (3) The fuel pool sock filter tank occasionally exceeds 100 mR/hr according to licensee personnel but the area is not locked. Measurements made during the appraisal did not detect any radiation levels in excess of 100 mR/hr in the vicinity of the fuel pool sock filter tank. The above situations represent noncompliance with 10 CFR 20.203(c)(2). It was noted that high radiation area definitions in the plant procedures and 10 CFR 20.202(b)(3), being slightly but significantly different, may have lead to the noncompliances noted above. The plant's definition refers to "general-area" radiation levels of greater than 100 mR/hr. "General area" is not necessarily interpreted by licensee personnel to include isolated areas accessible to personnel such that whole body doses exceeding 100 mrems are possible in an hour.

Contaminated area access is controlled through area postings and special access requirements. Area status sheets are used to provide contamination information, but in some cases the only indication of a contaminated area was the presence of radiation tape on the floor. The lack of a more visible barrier, such as radiation rope, detracts from the degree of control. Contaminated areas are defined by the licensee as those areas in which smearable contamination exceeds 400 dpm/100 cm^2. Conventional stepoff pads are not used to delineate ingress/egress points; radiation tape is used instead. The sole reliance on radiation tape to delineate contamination areas and step-of areas could lead to confusion for workers not accustomed to this facility's control methods.

Based on the above findings, improvement in high radiation area access controls is required to achieve a fully acceptable program. In addition, the following matters should be considered for improvement of this portion of the licensee's program: (1) upgrading of the placement and updating of radiation area postings to ensure that posted information clearly defines the extent of the radiation area; (2) re-evaluation of the sole reliance upon radiation tape to identify contamination and step-off areas.

9. Instrumentation

The licensee's supplies, use, limitations, and maintenance of portable and fixed radiological instrumentation were reviewed. Specific

problems were identified regarding extendible probe survey instruments, calibration and use procedures for certain instruments, personnel monitoring instrumentation at access control, survey instrument testing before use, and area monitor range limitations. Several of these problems reflect the plant and instrumentation age. Increased licensee attention in this area is needed.

a. Beta-Gamma Dose Rate Survey Instruments

Big Rock Point uses a variety of portable ion chamber and GM instruments for assessing beta and gamma dose rates. These instruments include Eberline RO-2's (9 units); Jordan Radguns (6 units); Victoreen, Baird Atomics, and Technical Associates cutie pies (5 units total); Victoreen Radectors (6 units); GM Auto Digimasters (4 units); and one Teletector. Out of service time for calibration and for maintenance has been minimal. Instrument supplies appeared adequate except for extendible probe instruments. Only one extendible probe instrument, for high exposure rate measurements, was possessed. This could lead to needless personal exposures if the one instrument is inoperable or if a need for simultaneous use of the instrument exists. The instrument supplies listed above include emergency response instruments located both onsite and offsite.

Procedures governing use and calibration of these instruments are adequate for gamma radiation. Beta correction factors are included in applicable instrument use procedures. The procedures include a method to check the beta correction factor but only one survey instrument is routinely checked. Beta correction factors are not posted on the survey instruments. Such posting appears warranted due to the variability of the correction factor with instrument type. Another problem noted was the lack of check sources for verifying the operability of the survey instruments before their use. Such checks are described in ANSI N323-1978. According to licensee personnel, survey instrument operability is seldom verified before use. On those few occasions when a check is made, a known plant radiation field is used as a source.

Based on the above findings, improvements in the following areas are required to achieve a fully acceptable program. (1) Additonal extendible probe survey instruments are needed. (2) A convenient method to verify survey instrument operability before each use is needed. In addition, survey instrument use instructions for beta field evaluations should be considered for improvement in this area.

b. Neutron Dose Rate Survey Instruments

Portable neutron dose rate measurement instrumentation is somewhat more limited. Three neutron dose rate instruments are

available at BRP. These include two Radiation Counter Laboratories neutron counters and one AN/PDR-70 rem meter. Of these, only the rem meter is routinely used and kept in calibration. Use and calibration procedures for both types of instruments appeared adequate. Calibrations are performed onsite using a 5 curie PuBe source.

An unresolved problem arose in April 1979 when corporate health physics personnel were calibrating albedo-neutron TLDs to the BRP neutron flux. The corporate neutron survey instrument and the plant neutron survey instrument disagreed in their neutron measurements by a factor of approximately two. The disagreement had not been resolved as of the time of this appraisal.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but the disagreement in the responses of the plant and corporate survey instruments should be resolved.

c. Contamination Detection Instruments

Portable contamination survey instrumentation consists of Thyac Survey meters with hard wall GM tubes, Eberline E-520's with thin window pancake probes (primarily Eberline HP-210 probes and two Eberline HP-260 probes). The plant also had two Eberline E-520's with alpha detection probes which were rarely used. In addition, eight personnel friskers and the laundry frisker are located in the plant. Although some of the contamination detection instruments have dual meter scales in cpm and mR/hr, these instruments are not used to measure dose rates according to licensee personnel.

There were no procedures addressing use or calibration of the contamination detection instruments. Pulse generator and GM tube voltage checks (per manufacturer's specifications) are performed annually by the I&C group but efficiency determinations are not conducted. Counting efficiency checks made by the Appraisal Team using a licensee source (35,000 dpm Cs-137) yielded a range of efficiencies from 1% to 25%. Efficiencies for the instruments were not documented by the licensee. No discernible response was noted on the laundry instrument for the 35,000 dpm source. The background on the laundry instrument was about 2500 cpm. The frisker located at Access Control had the best efficiency, but as noted in Section 8, it is frequently bypassed

Based on the above findings, development and implementation of calibration and use procedures covering contamination survey instruments are required to achieve a fully acceptable program.

d. Portal Monitors

The plant has two installed portal monitors, one at Access Control, the principal exit from the radiologically controlled plant area, and one at the guard house, the exit from the restricted area. The Access Control portal monitor is an elbow height unit with side and foot detectors while the guard house monitor is a conventional unit with side, top, and foot detectors. The elbow height unit poses a problem because individuals were frequently observed to rest their arms on the upright posts with hands well away from the detectors. Replacement of the elbow height portal monitor with a full height model and the addition of a hand and foot counter would significantly improve the contamination detection capabilities at Access Control.

The detectors on both portal monitors were found to alarm consistently with a 100,000 dpm source in contact, but not all would alarm consistently using a 35,000 dpm source. The guard house monitor was slightly more sensitive than the access control monitor. The foot detector on the guard house monitor was set to detect a minimum from about 15,000 dpm to 150,000 dpm, depending on the location of the contamination on the shoe bottom. One detector on the access control monitor did not alarm. A pancake probe GM frisker was located at access control but, as noted in Section 8, it was not consistently used by workers.

There are no formal procedures for the calibration or alarm setting of either portal monitor. Alarm set points are checked and adjusted using a portable survey instrument and a check source. These checks are conducted at approximate 6 to 12 month intervals.

Based on the above findings, improvement in personal contamination detection capability, especially at Access Control is required to achieve a fully acceptable program.

e. Continuous Air Monitors (CAMs)

The licensee has three continuous air monitors (CAMs) which are used for trend monitoring and detection of gross changes in airborne radiological conditions. During reactor operation a particulate filter CAM is located on the turbine deck and two CAMs are located in the containment sphere. The particulate filter CAM located just inside the personnel air lock monitors general containment air and the particulate and charcoal filter CAM monitors the exhaust air from containment. During refueling outages, the exhaust air CAM and the turbine building CAM are both used on the refueling deck. Annual calibrations of the

CAM's appeared adequate, however, a flow rate meter verification should be included in the calibration procedure. A minor discrepancy was noted regarding the documented alarm setpoints for the CAM's between volumes 11 and 12 of the Big Rock Point Manual.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but the following matters should be considered for improvement: (1) Include the air flow rate meter in the CAM calibration procedure. (2) Resolve the discrepancy over alarm setpoints for the CAMs.

f. Instrument Control

Survey instruments are stored in several locations, both onsite and offsite. The principal storage location is at Access Control where separate cabinets for operational and out of commission instruments are located. The segregation methods for functional and nonfunctional instruments appeared adequate with the possible exception of two neutron counters which are normally used only during outages and which are not routinely maintained calibrated. Although survey instruments are located throughout the plant, no inventory by location is maintained. A calibration status board is maintained in the health physics office. No problems were noted regarding scheduling or completion of calibrations.

Based on the above findings, this portion of the licensee's program appears to be acceptable, but could be improved if records of instrument storage locations were maintained.

g. Area Monitors

The plant's 20 area monitors have three decade ranges with a maximum capability of either 10, 100, or 1000 mR/hr and would therefore be of limited use in accidents involving large fission product releases. According to licensee personnel, there are no plans to upgrade the system beyond the NUREG-0578 requirement for high range containment monitors. As communicated to NRC (NRR) in a letter dated December 27, 1979, the licensee intends to install two high range containment monitors by January 1, 1981.

Area monitors are calibration checked monthly using a 100 uCi cobalt-60 source and a calibrated survey instrument. No problems were noted with the calibration checks or alarm setpoint determinations. Display and alarm functions are available in the control room.

Based on the above findings, this portion of the licensee's program is acceptable. Consideration should be given however,

to conducting a thorough evaluation of anticipated area monitoring data losses in various accident situations. This information should be incorporated into accident response training to ensure that required radiation level information can be developed by alternate means.

h. Effluent Monitors

The licensee does not routinely use effluent monitors for quantification of radioactive releases. However, in nonroutine situations the stack gas monitor may be used for quantification purposes. Calibration of this monitor was found to meet the technical specification requirements (monthly solid source calibration check). In addition to the monthly calibration checks, three-point liquid calibrations (cesium-137) are performed at approximate two year intervals. Problems noted included: (1) There is no requirement for conduct of the fluid calibrations specified in licensee procedures. (2) No energy response information for the monitor was available. (3) The licensee had not verified the monitor calibration through analysis of stack grab samples. This was the only effluent monitor calibration which was reviewed in detail.

The conversion curve for the high range noble gas monitor installed per NUREG-0578 was calculated using a computer program developed by the corporate office. This conversion was not verified by the Appraisal Team. The high range noble gas monitor does not read out in the control room. The remaining effluent monitors do alarm and/or read out in the control room. A problem noted was that the area and liquid process monitors were combined in a single alarm display in the control room. This alarm does not have reflash capabilities. The air ejector and stack gas monitors have separate alarms and therefore do not have a similar problem.

Based on the above findings, this portion of the licensee's program appears to be acceptable but resolution of the specified monitor calibration and alarm reflash problems should be considered for improvement in this area.

10. ALARA

Although a general management policy statement promoting ALARA exists, a strong working commitment to ALARA was not evident. The ALARA concept was found to be implemented fairly well on the working level by the C&RP technicians but shortcomings were found in formalization on the management level. Shortcomings were also evident among individual workers. The Appraisal Team feels strongly that the licensee must improve the formalization of the ALARA program and must effectively communicate top management's support of ALARA to all levels of plant personnel.

Shortcomings in management's commitment to ALARA are evidenced by the following: (1) lack of specific ALARA goals committed to by plant management; (2) lack of formal ALARA review of procedures and design modifications; (3) lack of strong management action to correct ALARA problems; (4) lack of feedback to C&RP technicians regarding resolution of job monitoring problems; and (5) the need for improved contamination detection practices at frisker and portal monitor locations. At the individual worker level the Appraisal Team noted numerous instances of workers failing to frisk themselves and evidence in post job-monitoring evaluations of a lack of cooperation with the C&RP technicians. Although C&RP technicians generally appeared to have a good attitude toward ALARA and exposure reduction for both themselves and the workers under their control, added emphasis on backing off to lower dose rate areas following initial job surveys may be warranted, based on two observed jobs.

Requirements and procedures for frisking need further definition to ensure adequate contamination detection sensitivities. These shortcomings are particularly evident at Access Control where personnel were repeatedly observed passing through a portal monitor but bypassing a frisker, despite a sign indicating that frisking was required. The portal monitor was not nearly as sensitive as the frisker for detecting contamination. (See Sections 8 and 9 for details.)

Post job evaluations can be a valuable tool in determining where exposure reduction can be improved. While extensive use has not been made of the evaluation forms, problems indicated include inadequate preplanning, particularly regarding tool availability and job familiarity and a too frequent lack of cooperation with C&RP technicians. The post job evaluation forms are good tools but need stronger follow-up combined with feed back to C&RP personnel. The general practice of providing direct C&RP coverage of most maintenance jobs as opposed to wider use of RWPs may actually result in higher man-rem exposures (due to C&RP technician exposures).

As noted in Section 4 of this report, radiological training was found to be deficient in several areas. In addition, job specific training, although conducted before certain maintenance jobs, was found to suffer from a lack of routine involvement by C&RP personnel. Adequate radiation protection training is an integral part of an effective ALARA program.

While an informal guideline has been established to maintain individual doses below 5 rems per year, the only formal controls required by plant procedures are to equalize doses above 1000 mrems per quarter among workers within a department and to observe administrative limits of 1000 or 2400 mrems per quarter (determined by completion of NRC-4). There are no established daily or weekly dose guidelines or administrative limits nor has the licensee established man-rem goals.

Procedures and plant design modifications receive a variety of reviews, some of which may qualify as ALARA reviews. However, there is no formal definition of what requires an ALARA review, who is to perform the review, or how the review is to be conducted.

Based on the above findings, significant improvement in the licensee's ALARA efforts are required to achieve a fully acceptable program. This improvement should be directed specifically at management's implementation of a more formalized ALARA program which includes adequate means for ensuring the effectiveness of the program at all plant levels.

11. Radioactive Waste

Radioactive airborne and liquid effluent activity released from the site has been relatively low for the past several years. Solid radioactive waste volume also has been relatively low. However, several identified airborne effluent problems require corrective actions. Additionally, the capability of the liquid radwaste system for handling high activity liquid under accident situations is limited due to storage and shielding considerations.

a. Liquid Effluent Control

A program of water control, including waste water generation, inleakage minimization, and processing and reuse has resulted in a significant reduction of radioactive liquid effluents over the last several years. Liquid activity (less H-3) discharged from the plant has been under one curie per year for the last four years (average of about 0.6 curies in about 6E5 liters per year). Liquid radwaste is batch released based on prerelease analysis of grab samples. Liquid radwaste treatment consists of demineralization and filtration. An original equipment radwaste evaporator was replaced by micron range filters several years ago. Licensee personnel did not have information available regarding typical DF's for the filters. Demineralizer resins (condensate, reactor water cleanup, and radwaste) are not normally regenerated except for the makeup (well water) demineralizer.

System storage capacity is limited (about 35,000 gallons) and is taxed at times during routine operations, especially when condenser tube leakage becomes significant. The system tankage, not all of which is shielded, typically is approximately one-third full. Due to shielding and capacity limitations, the liquid radwaste system would be of limited usefulness in accidents which generated large quantities of high activity water. An additional impediment to use of the radwaste tanks to contain highly radioactive water is that the tanks vent into the plant with removal via the ventilation system to the plant stack.

In response to NUREG-0578, the licensee reviewed the integrity of liquid systems outside of containment that could be expected to contain radioactive liquids in an accident situation. Amended responses were submitted to NRR (DOR) on January 18, 1980, and March 14, 1980. The core spray system was identified as requiring future follow-up regarding leakage prevention.

Based on the above findings, this portion of the licensee's program appears acceptable; however, improvement would result from a thorough evaluation of limitations imposed by the installed liquid radwaste facilities in case of an accident which generated large quantities of highly radioactive water.

b. Airborne Effluent Control

Airborne radioactivity releases are relatively low. Noble gas releases have averaged about 400 uCi/sec over the last four years. Iodine and particulate releases have averaged about 6E-4 uCi/sec over the same period. Noble gas releases are quantified from weekly and daily air ejector grab samples; iodine and particulate releases are quantified from continuous stack samples which are changed out weekly. With the exception of chemistry and counting laboratory ventilation exhaust, potentially radioactive air and gases are released from a single 240 foot stack. Offgas is delayed approximately 30 minutes in a holdup pipe and directed through a HEPA filter before release from the stack. With the exception of HEPA filters in the offgas and the chemistry and counting laboratory ventilation exhaust, there is no removal treatment of airborne effluents.

There are several weaknesses associated with airborne effluent controls. (1) Noble gas releases via ventilation air are not quantified. (The stack noble gas monitor is not normally used to quantify noble gas releases.) (2) No monitor or sampler is installed in the ventilation release path from the chemistry and counting laboratory nor is grab sampling of this potential release path routinely conducted. (3) The HEPA filters installed in the offgas and the laboratory ventilation systems are not tested in place for leakage. (4) There are no formal criteria for changeout of the two HEPA filters. The pressure differential across the offgas HEPA is logged routinely; the pressure differential across the laboratory ventilation HEPA is not recorded. The offgas HEPA is changed approximately annually during refueling outages. The laboratory ventilation HEPA apparently has not been replaced for at least five years. (5) The offgas system is not isolable to preclude release of offgas to the stack. The technical specification required isolation valve actuation (on high air ejector monitor response) functions but an additional release path exists which prevents loss of condenser vacuum and automatic reactor scram and turbine trip.

This matter, which was identified as early as 1972, has been administratively treated by requiring a manual reactor scram at approximately 50,000 uCi/sec noble gas release rate (a release rate well below the instantaneous technical specification limit of 10 curies per second). The actual bypass release path, however, has not been specifically identified. A technical specification change (Amendment 14) was issued in recognition of the offgas isolation problem.

In response to NUREG-0578, the licensee installed a high range noble gas monitor for quantification of anomalous airborne releases from the plant stack. A procedure for use of the monitor has been established. Refer to Section 4(d) of this report for information regarding training in use of the monitor. Since stack iodine and particulate samples may be inaccessible under accident conditions, the licensee has developed a procedure for downwind sampling and calculation of releases. A similar method is available for quantification of unmonitored noble gas releases. Silver zeolite will be used to collect iodine samples.

Based on the above findings, the following inprovements are required in order to achieve a fully acceptable program. (1) Methods for quantifying noble gas releases, from the plant stack should be revised to include methods for quantifying anomalous releases and for verifying, on a continuing basis, that release paths other than the offgas system do not contribute significantly to total releases. (2) Periodic determinations should be made to ensure that the laboratory ventilation system is not a significant airborne release point. (3) Formal change out and testing criteria should be developed for the offgas and laboratory ventilation HEPA filters. In addition, the specific leakage path(s) from the offgas system should be identified and corrected in order to improve this portion of the gaseous waste program.

c. Solid Radioactive Wastes

Solid radioactive wastes consist primarily of general plant wastes, Cuno and sock filters, and resins from the reactor water cleanup, radwaste, and condensate demineralizers. The licensee's solid radwaste volume historically has been relatively low. This is attributable to segregation of contaminated and noncontaminated wastes, extensive use of a compactor for most general plant wastes, and use of dewatering rather than solidification for all spent resins.

Burial consigned resins with specific activities greater than one microcurie per cubic centimeter (for radionuclides having half lives greater than five years) apparently will be required to be solidified, or packaged in high integrity containers,

after June 1981. The licensee currently has no facilities to solidfy waste resins, nor are the three types of resin wastes segregated based on specific activity. The mixed waste resins typically have a specific activity in excess of one microcurie per cubic centimeter. Shipment of spent resins in solidified form would significantly increase the volume of resin wastes shipped to burial sites. This volume increase may cause problems due to burial site allocations.

Several problems were identified with low-level and high-level waste storage facilities. Low-level compactible wastes are temporarily stored in a portion of room 121 in the turbine building. The waste, contained in plastic bags, was noted to be: (1) overflowing the designated storage area (2) inconsistently labelled to indicate the presence of radioactive material, and (3) located in a posted hydrogen zone (combustible material, including paint covered rags, were in the bags). The licensee's practice of storing new (empty) and waste filled 55-gallon drums outdoors poses potential problems. It would be preferable to store these drums such that they are protected from the weather, therefore minimizing problems with corrosion and inleakage of water. Six waste filled drums were checked for water during this appraisal; no liquid was found. The licensee's methods for handling resin storage and disposal also pose potential problems. The procedure has been to have a contractor come onsite to dewater the resins when all storage capacity (two tanks of 10,000 and 5,000 gallons) are nearly full. Thus, there is a period of time when the licensee has only minimal reserve storage capacity. This capacity might be needed if there were an abnormal generation of resins or if there were a "freeze" on the disposal of resins.

Based on the above findings, improvements in temporary storage of low-level compactible radwaste is required in order to achieve a fully acceptable program. In addition, 55-gallon drum storage methods and spent resin storage and disposal practices should be reconsidered to improve these areas of the licensee's solid radwaste program.

12. Facilities and Equipment

a. Chemistry and Counting Laboratory

The licensee's technical specifications require various gaseous and liquid effluent and reactor coolant constituents to be maintained within prescribed limits. To ensure that these limits are observed, the licensee periodically analyzes environmental and coolant samples in the chemistry and counting laboratory.

In order to verify the licensee's ability to perform these analyses, the assignment of responsibility and authority for management control of the analytical laboratory was examined and the laboratory's analytical capability reviewed. The licensee uses a proportional counter to analyze for alpha and beta and a GeLi system, with a NaI system as a backup, to analyze for gamma. Discussion with the licensee revealed that source checks and background checks are performed daily. The instruments are recalibrated annually, and after repair or maintenance. Efficiency verification counts must be within a prescribed range. The inspector reviewed various procedures for the chemistry lab and the counting lab and determined that the procedures appeared to be technically adequate. No significant discrepancies from the analytical laboratory quality assurance guidance contained in Regulatory Guide 4.15 were noted. The laboratory and equipment were examined and no problems were noted. One problem was noted in the training of the laboratory technicians. Initial training consists mainly of on-the-job training along with supervision by senior technicians. The training provided, when combined with the continual rotation between chemistry and radiation protection duties, does not appear acceptable for technicians who are unfamiliar with a chemistry laboratory. Inadequate training apparently contributed to a recent event concerning pH analysis of a reactor coolant sample. The technician did not follow proper procedure to determine the pH of the sample, resulting in an erroneous out-of-specification result. The technician also failed to report the out-of-specification analysis result to the Shift Supervisor. The initial error, failure to correctly set-up the pH instrumentation (the electrodes were not rinsed after adjusting the pH meter to a buffer solution), exhibited a basic lack of understanding of analytical laboratory techniques and reflects poorly on the licensee's training program.

The necessity for technicians to refamiliarize themselves with laboratory instrumentation after periods of other duties compounds any training inadequacies. As noted in Section 3, consideration should be given to permanently assigning technicians to chemistry activities and to radiation protection activities.

Based on the above findings, improvement in the training provided technicians working in the chemistry and counting laboratory is required to achieve a fully acceptable program.

b. Health Physics Facilities

The facilities available to the C&RP Department appear to be adequate for normal operations but could be taxed under accident conditions.

The main radiation access control point, which is located adjacent to the C&RP office, includes a portal monitor that functions from the hips down and a frisking station. See Section 9 for comments regarding problems with the monitoring equipment. Personnel decontamination facilities available to the C&RP Department include a single shower located just prior to egress from the controlled area. A small sink and a supply of decontamination solutions and equipment suitable for cleaning up minor contamination problems is located in the access control area. There is no designated medical treatment area at Big Rock Point. The Plant Health Physicist and the Shift Supervisors have received first aid and CPR training. This training plus first aid kits provide the onsite medical capability.

Based on the above findings, this portion of the licensee's program appears to be acceptable (except for the instrumentation problems discussed in Section 9); however, additional consideration should be given to methods for handling access requirements under accident conditions.

c. Calibration Facility

The survey instrument calibration facility was found to be generally adequate but improved housekeeping and recordkeeping was needed. The facility log book indicated that the primary source was a 2.4 curie cobalt-60 source instead of a new 10 curie cesium-137 source. All other sources contained in the log were present. No monitoring instrument or audible alarm is available in the facility to alert when the primary source is exposed, although a blinking light is visible outside the door. This was not judged a problem since normally only one person occupies the facility while calibrating instruments.

Based on the findings in this area, this portion of the licensee's program appears to be acceptable; however, housekeeping and recordkeeping matters should be considered for improvement.

13. Accident/Re-Entry

The scope of the review in this area was limited to the Chemistry and Radiation Protection (C&RP) Department accident and re-entry preparedness capability. The appraisal primarily focused on six areas of interest: instrumentation, analytical capability, re-entry capability, expanded support capability, training, and environmental capability. While some work in each of these areas has been undertaken as a result of TMI, additional planning and training in certain areas is still needed.

A number of portable instruments (both monitoring and sampling) have been purchased by the C&RP Department within the last year to upgrade instrumentation readiness. As noted in Section 9 of this report, the Appraisal Team has identified the need for additional extendible probe radiation monitoring instruments. These instruments are particularly useful under accident conditions. Also, as noted in Section 9, the installed area monitors would probably not be of use in a serious accident, due to their limited ranges. The licensee is in the process of upgrading area and effluent monitoring capabilities in response to NUREG-0578.

Two emergency procedures for sampling and monitoring under accident conditions have been implemented by the licensee in response to NUREG-0578. One procedure, EP-1, deals with in-plant (but not in-containment) monitoring for airborne iodine; and the other, EP-2, addresses sampling of the core spray heat exchanger as an indicator of core damage. Due to the lack of containment shielding, the core spray samples would not be available in cases of severe core damage. An ionization chamber has been installed to assess core damage in situations prohibiting collection of core spray samples. On a longer term basis, the licensee is considering the use of in-line monitors for reactor coolant and containment atmosphere radioactivity determinations. Details of these items were supplied NRC (NRR) in letters dated 12/27/79, 1/18/80, and 3/14/80.

A contractor is presently preparing procedures and training manuals to assist in re-entry efforts. These procedures are expected to be completed and training conducted during May 1980. Photographs of much of the plant are available to assist in a re-entry effort.

In the event of an accident, expanded health physics support would be furnished by the Corporate Office and by the staffs of the Palisades and Midland Plants. Plans call for augmenting the C&RP staff with six to twelve health physics/chemistry technicians from these plants within six hours after receiving a request. As noted previously in this report, standardization of health physics practices at the three plants would enhance the effectiveness of this emergency support.

As noted in Section 4 of this report, C&RP technician training appears quite weak. This weakness is especially evident for accident response. According to licensee personnel, C&RP technician training in response to radiological accidents will be stressed in conjunction with scheduled emergency plan and re-entry training in the near future.

No significant problems were noted with the licensee's emergency environmental monitoring capability. During normal working hours, the emergency enviornmental monitoring program would be directed by the Chemistry and Radiation Protection Supervisor or the Plant Health Physicist, with support from the corporate staff as needed. Since

there presently is no offshift C&RP staff coverage, the site Emergency Director, who is the Shift Supervisor, would contact a C&RP technician at home. Two emergency air sampling kits containing portable air samplers operated from a 12V battery are located in the Charlevoix County Sheriff's office building. Other portable air samplers are available onsite for use as needed. The licensee recently issued an emergency procedure on using these air samplers and performing the calculations, all radiation protection technicians have been trained in this procedure.

A separate NRC evaluative effort is being conducted regarding nuclear reactor emergency planning activities. The emergency planning evaluation for the Big Rock Point plant has been initiated but is not yet complete. In light of this ongoing effort, the Health Physics Appraisal Team will refrain from specific evaluations of the licensee's emergency response capabilities except to the extent that conduct of the routine health physics program impacts on the licensee's capability to respond to accident situations. In this regard, the most glaring deficiency observed is in training of C&RP personnel. This and other problems are highlighted in the respective sections of this report.

14. Exit Interview

The Appraisal Team met with licensee representatives (denoted in Paragraph 1 at the conclusion of the Appraisal on March 14, 1980, and by telephone with Mr. C. Axtell on April 30, 1980. The inspectors summarized the scope and findings of the Appraisal. The findings fall into three categories:

A. Significant Appraisal findings are specified in Appendix A to the letter forwarding this report and are summarized at the conclusion of applicable subsections of this report. The licensee's responses to these findings are to be submitted in writing and will be reviewed when received.

B. Findings of lesser significance but which are considered instrumental to improvement of the licensee's health physics program are also summarized at the conclusion of applicable subsections of this report. The licensee's actions in response to these items will be reviewed during subsequent inspections.

C. Noncompliance items are specified in Appendix B to the letter forwarding this report. The licensee's responses to these findings are to be submitted in writing and will be reviewed when received.