U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-289/90-03

Docket No. 50-289

License No. DPR-16

Licensee: GPU Nuclear Corporation
P. O. Box 480
Middletown, Pennsylvania 17057

Facility Name: Three Mile Island Unit 1

Inspection At: Middletown, Pennsylvania

Inspection Conducted: January 16-19, 1990

Inspectors: S. Sherbini 1/23/90
for D. Chawaga, Radiation Specialist — date
Facilities Radiation Protection Section

S. Sherbini 1/23/90
S. Sherbini, Senior Radiation Specialist — date
Facilities Radiation Protection Section

Approved by: W. Pasciak 1/24/90
W. Pasciak, Chief, Facilities Radiation Protection Section — date

Inspection Summary: Inspection on January 16-19, 1990 (Report No. 50-289/90-03).

Areas Inspected: Routine, unannounced safety inspection of the radiological controls program, including refueling outage work and the status of previously identified items.

Results: Within the scope of this inspection, no violations were identified.

## DETAILS

### 1.0 Personnel Contacted

### 1.1 Licensee Personnel

D. County, Lead QA Auditor
* D. Etheridge, Manager, Radiological Engineering, TMI-1
* H. Hukill, Vice President and Director, TMI-1
* R. Rolph, Radiological Assessor
* A. Palmer, Manager, Radiological Controls Field Operations, TMI-1
* R. Shaw, Director, Radiological Controls, TMI-1

### 1.2 NRC Personnel

R. Brady, Resident Inspector
* D. Johnson, Resident Inspector
* T. Moslak, Resident Inspector

### 2.0 Status of Previously Identified Items

### 2.1 (Closed) Follow-up Item 88-19-01

This item was opened in connection with the qualification of senior Radiological Controls Technicians (RCT). The licensee did not have clearly defined criteria regarding the manner in which experience is to be credited toward classification as senior RCT. The licensee has subsequently developed a set of criteria for this purpose. The criteria were reviewed and were found to be clear and well defined and address the different possible types of experience. Although these criteria represent a substantial improvement, the inspector stated that there were some items that needed further consideration. These include the following:

. Experience gained as Engineering Laboratory Technician (ELT) in the Navy is to be credited on a 1:1 basis with no time limit for duties as Radiological Controls Monitor during shipyard, overhaul, tender, and training. Other experience in the Navy is to be credited on a case by case basis. Current practice, however, is to credit ELT experience on a 2:1 basis (one year of credit per two years ELT) with a maximum time to be credited for such experience.

. Experience for jobs such as decontamination, count room technician, frisking/laundry monitor, dosimetry technician, and respiratory protection technician is to be credited on a 1:1 basis with a maximum of three months in each of the above areas. However, on this basis, it would be possible to

accumulate as much as 15 months of the minimum two years of required experience for senior RCT classification without performing work that is most directly related to a senior RCT's duties.

. There is no minimum amount of power plant experience specified in the experience requirements. This is contrary to current practice, which in some cases requires up to a minimum of one year of nuclear power plant experience.

. The procedures governing qualification of Radiological Controls Field Operations personnel, 9100-ADM-2622.01, "Radiological Controls Field Operations Personnel Qualifications/Training" has not been revised to reflect the new requirements. The procedure also specifies that technicians may progress from Technician C (entry level with no experience) to Technician B (junior technician) in three months and from B to technician A (senior technician) in a minimum of one year. The only stated requirements for making the transitions is that the technician pass the required oral, written, and practical factors examinations. Based on this progression, it would be possible to become a senior technician, starting with no experience or formal background in health physics, in 15 months. The licensee stated that although this may appear to be the case, it does not occur in practice because it is unlikely that anyone would be able to pass the required examinations in such a short period of time and without going through a period of formal training.

The licensee stated that they will review these concerns and take appropriate corrective actions. It should be noted that the above concerns apply to the written policies specified in the licensee's memos, policy statements, and procedures. In practice, the licensee's senior RCTs have a level of experience that puts them substantially above the levels at which the above items would be of concern. The resumes of all the senior contractor technicians hired for this outage (22) were reviewed during this inspection. It was found that they all had experience that exceeded the minimum requirements for their positions as specified in the applicable ANSI Standard (ANSI N18.1-1971).

2.2 <u>(Closed) Follow-Up Item 88-19-02</u>

This item was opened in connection with a dose assessment performed for assigning a skin dose to a worker following contamination by a hot particle. The hot particle was analyzed on a gamma spectrometer and found to be a fuel fragment. The dose assessment was done using the results of the gamma analysis. The licensee had concluded at that time that the particle probably did not contain any significant amounts of pure beta emitting isotopes and that the dose assessment based on the gamma analysis was probably accurate. However, since there was no strong basis for the

assumption of negligible pure beta emitter contribution to the dose, it was decided to analyze the particle for such activity. The licensee has subsequently sent the particle out to be analyzed by a vendor. The results of the analysis showed that, although the particle did contain some pure beta emitters, mainly strontium and its daughter yttrium (of the order of 1E-3 uCi) the amount was relatively insignificant and did not substantially add to the dose already assessed on the basis of the gamma analysis. The dose of record assigned to the contaminated worker will therefore not be changed as a result of the latest analysis results.

## 3.0 Staffing for the Refueling Outage

Much of the needed radiological controls staff for the current refueling outage consists of house personnel, partly the permanent Unit 1 staff augmented by staff from Unit 2 on temporary assignment to Unit 1. The licensee has also instituted a novel system of using auxiliary operators to help man the access control point to the radiological controls areas (RCA). Also, chemistry technicians are used to help operate the health physics count room equipment. The licensee stated that auxiliary operators and chemistry technicians have a reduced work load during outages and therefore represent available technically trained personnel. The auxiliary operators were given training to prepare them to assist at the control point. The training consisted of four hours of classroom and computer system instruction, and covered topics such as operation of the access computer system, issue of dosimetry and air samplers, source checking of survey instruments, adjusting setpoints on alarming dosimeters, and filling out the various required forms and logs. The chemistry technicians received a similar period of training in the use of the various counting equipment used in the count room. Both the auxiliary operators and the chemistry technicians are meant to assist the health physics staff in these duties. They are not to perform these duties unless supervised by a health physics technician. Observation of the auxiliary operators and chemistry technicians during this inspection showed that they performed their duties efficiently and accurately. Their experience at these duties would also probably be of assistance to them during their regular duties because of the added perspective on radiological controls activities. The inspector expressed some reservations concerning the brevity of the training period to prepare these personnel for their duties. However, observations of the technicians at work did not provide evidence to substantiate these reservations.

The licensee has augmented the house staff with 24 contractor technicians, 22 of which are senior RCTs and 2 junior RCTs. A review of the resumes of the senior RCTs showed that they all exceeded the minimum qualifications requirements. The licensee also verified their experience with previous employers.

## 4.0 Audits and Assessments

The requirements for auditing the radiological controls function on site are specified in 1000-PLN-4010.01 "GPU Nuclear Corporation Radiation Protection Plan", Section 4.0, "Audits, Reviews and Reports of the GPUN Radiological Controls Program". According to this plan, the following levels of review are required:

. The Radiological Engineering Section shall audit the program. No frequency is specified for this function, nor are the areas to be audited specified. This part is implemented by Procedure 9100-ADM-1201.09, "Radiological Controls Internal Assessments". According to this procedure, the program is subdivided into 8 areas and at least one area is to be assessed every six months. This schedule provides for an assessment cycle of about four years; that is, each area of the program is assessed once every four years.

The inspector expressed concern that a frequency of once every four years appears to be too long. The licensee stated that although the procedure calls for a minimum of one area per six months, they actually strive to complete an area every three months, giving an assessment cycle of two years.

. The Plan calls for assessments to be conducted " on a continuous basis" and that the results of this activity are to be presented in a monthly report to the Director, Radiological and Environmental Controls, a corporate officer.

This function is being performed by the Radiological Assessor. The Assessor reports directly to the corporate Director and performs this assessment function for both Units 1 and 2.

. The plan calls for a "system ... to allow any individual to identify radiological deficiencies and/or suggest improvements". This function is being implemented by a number of procedures, including 9100-ADM-1201.01, "Awareness Reporting", which allows any worker to submit an awareness report that either presents a suggestion for improvement or a concern; 9100-ADM-1201.01, "Radiological Awareness Critiques", also requires critiques to be held and Radiological Incident Reports to be generated following specified radiological incidents; and 9100-ADM-4241.05, "Dosimetry Investigative Report" which requires reports to be generated following incidents involving dosimeters and the assessment of dose to a worker.

. The Plan also calls for audits by the QA department as part of the corporate Quality Assurance Plan. The QA staff performs QA audits of the radiological controls program on an 18 month cycle which normally involves auditing one third of the program areas per audit, thus completing review of the program in three such audits.

The Radiological Controls Department also conducts routine surveillances of the plant. In these surveillances, an assigned radiological engineer tours specified areas of the plant and observes work in progress, posting, housekeeping, and similar functions and provides a report of the findings.

Selected reports generated by the above audit and assessment functions were reviewed. Awareness and Radiological Incident Reports were also reviewed. Most of the reports were found to be of good quality and were being performed in accordance with the required frequencies. The inspector stated that the review system lacks a requirement for periodic assessments by an independent expert in the field. The licensee stated that the Plan did contain a requirement for such an assessment in the past. However, in an effort to reduce dependence on outside consultants, this provision had been deleted. The licensee further stated that there are independent reviews being performed by corporate health physicists on a periodic but non-routine basis. This function, however, is not required by any company policy or procedure. The licensee also stated that they depend on outside organizations for independent reviews, such as the NRC, the Institute For Nuclear Power Operations (INPO), the American Nuclear Insurers (ANI) and others.

## 5.0 Posting and Housekeeping

Tours of the facility showed that general housekeeping in the radiological controls area was acceptable in most areas, with the possible exception of some areas in the 281' elevation of the Auxiliary Building. Some locations on this level showed isolated instances of poor housekeeping, such as tape and some items of protective clothing on the floor and water flowing from leaky components in contaminated areas to areas outside the roped-off contaminated areas.

Posting of radiation and contamination areas and low dose areas was generally good. The postings were sufficient in number and clearly defined the posted areas. However, some posting inconsistencies were noted at the lower manway access points to both steam generators. These manways are accessed through two openings in the support pedestals of the steam generators. It was observed that for steam generator 'A', one access point in the pedestal was closed by a wire mesh barrier and was posted as a locked high radiation area. The other access point was covered by a temporary enclosure with a door in that enclosure. The door was posted as a high radiation area. Locked high radiation area conditions did not exist at the manway because the manway was closed by a temporary manway cover. The cover was posted as a locked high radiation area. In the case of steam generator 'B', one access point was open and unposted, and the other access point, through the temporary enclosure, was posted as a locked high radiation area. The temporary manway cover was in place over the manway but

the manway was not posted. The inspector stated that these postings were confusing and inconsistent. The licensee agreed and stated that the condition of the postings were probably due to the fact that work on the steam generators had just been completed at the time of the inspection tour and that the technicians had not had sufficient time to put up the proper postings. The licensee stated that postings should be updated more promptly and that they will ensure promptness in future activities.

## 6.0 Dosimetry

Observations during the tours indicated that workers were wearing their dosimetry in the proper locations and the proper dosimetry was being issued in accordance with procedures and proper practices with one possible exception. This was in connection with work that was observed during a tour of the Containment Building. The work was being done on a platform constructed over the reactor head, and the workers were engaged in disconnecting electrical connections from the reactor head. A review of the surveys for that job showed that the radiation field was coming from underfoot and that there was a fairly sharp dose gradient from the floor up, with the highest dose being at floor level and the dose dropping by a factor of about two at knee level. The workers, however, had only chest dosimetry. The inspector stated that it appeared that the dosimeters were improperly placed and that the current placement would not measure the highest dose to the whole body. The licensee stated that they had not supplied the workers with knee dosimeters because most of the work was done in a squatting position, which placed the chest dosimeters at knee level and thus measured the required dose. The licensee also stated that this question had been raised several years ago by another NRC inspector and that the inspector concurred with the licensee's practice. The inspector stated that the licensee should make a determination of the adequacy of the current dosimetery placement. The licensee stated that they will provide the workers with several sets of dosimeters at chest and knee levels to determine if knee dosimetry registers higher doses than the currently used chest dosimetry placement.

## 7.0 Survey Instruments

The number of survey instruments available for issue at the access point to the RCA were found to be adequate. Instruments are source checked before issue and at least once a day if they are in constant use. The source check is done using a source jig that contains three small cesium button sources and that allows the instruments to be placed in a reproducible position for checking. One weakness that was identified during the inspection was that the source check jig allowed only one range of each instrument to be

checked. That range is usually the lowest range on the instrument or the next higher range to that. The other ranges are checked once every three months during the quarterly calibration of the instruments. The inspector stated that there was concern that users of these survey instruments had no indication that the higher ranges of their instruments were functioning properly. The licensee stated that users of the instruments know that they should get some indication on the instrument on any scale if the field is sufficiently high to register on that scale and that if no such indication is noted the user would not use the instrument. The licensee also stated that they do have a source that can be used to check all the ranges on the survey instruments but that it was currently being used in Unit 2. They also stated that they will review this concern and take appropriate action. This item will be reviewed during a future inspection.

## 8.0 Program Improvements

The licensee has introduced a number of improvements in their program during this outage in an attempt to improve worker performance and to assure smooth progress of work. These improvements include the following:

. Erection of scaffolding during the past outage had been a problem because scaffolding work was not coordinated and the work crew was inexperienced. Scaffolding work during this outage was more efficient and better planned, and the work crew was better trained.

. The licensee has issued two-way radios to the radiological controls supervisors and to radiological controls technicians who are covering important jobs. The system is equipped in a manner that allows easy and clear communication from anywhere in the plant, including any area within the Auxiliary and Containment Buildings. The licensee stated that the radios have been found to be very helpful in quickly resolving any problems the technicians may encounter in the field and often without the need to stop work, which may result in increase in exposure because of the added transit and stay times. The licensee stated that the radios also allow supervisors to keep in constant touch with their technicians and to monitor job progress. The health physics staff can also tune in the channel used by operations and maintenance and can therefore keep informed on upcoming activities in these areas.

. The licensee has installed a video recorder system in the dressing area at the containment access point. The video plays continuously and may be watched while the workers put on their protective clothing in preparation for containment entry. The video shows proper practices to dress and undress and gives hints on how to avoid contamination.

. The licensee is using a laser video disk system to help in pre-job briefings. The inspector reviewed the system and found it to be of high

quality and to provide high resolution pictures of important work areas and components. The system may be used to visually walk the workers through the plant areas to reach their job location and to show them the components to be worked on and their locations.

## 9.0 ALARA

The exposure goal for the upcoming 8R refueling outage is approximately 275 man-rem. The major job classifications within this overall goal are as follows:

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| . Steam generator cold leg dams | 35 man-rem |
| . Steam generator plug removal | 30 |
| . Refueling | 30 |
| . Scaffolding | 25 |
| . Miscellaneous maintenance | 25 |
| . Reactor Building platforms | 19 |
| . Steam generator tube plugging | 18 |
| . ISI | 18 |
| . Steam generator feedwater nozzle replacement | 12 |
| . Valve maintenance | 10 |
| . Reactor coolant pump seals | 6 |
| . Support (radiological, radwaste, operations and surveillance) | 45 |
| Total | 273 man-rem |

The exposure for the remainder of 1990 non-outage operations is projected to be 4 man-rem per month, giving a total of 40 man-rem for routine operations and a total of 313 man-rem for 1990. The 1989 goal, a non-outage year, was 75 man-rem. Based on the currently available data, it appears that the actual exposure for 1989 will be significantly below the goal.

The source reduction measures that have already been implemented include the following:

. Partial replacement of fuel bundles with low cobalt bundles.

. Improve procedures for maintenance of stellite valves to minimize introduction of foreign material into the system.

. Use of high pH chemistry for the primary coolant system. The pH currently in use is 6.9. Improved water chemistry is also being used in the secondary side of the system.

. Consideration is being given to the dose savings that may be realized from a prolonged (24 month) cycle.

. Radwaste volume reduction efforts are being implemented.

In addition to the above, a "Cobalt Reduction Manual" is being used by Technical Functions as guidance in an effort to convert to low cobalt or no-cobalt alloys whenever a component is to be installed, maintained, or modified. The standard requires that the responsible engineer justify the use of alloys in any such activities to ensure that attempts have been made to reduce cobalt content whenever possible.

At the time of this inspection, the outage was in the early stages and most of the work remained to be done. It is therefore too early to determine whether the established goals will be achieved. Performance during this outage will therefore be reviewed during a future inspection.

## 10.0 Exit Meeting

The inspector met with licensee representatives on January 19, 1990. The inspector reviewed the purpose and scope of the inspection and discussed the inspection findings.