A REPORT ON

A REVIEW OF CURRENT AND PROJECTED EXPENDITURES AND MANPOWER UTILIZATION FOR GPU NUCLEAR CORPORATION

CONDUCTED BY

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CHAPTER I

OVERALL ASSESSMENT

CHAPTER I. OVERALL ASSESSMENT

Basic Energy Technology Associates, Inc., (BETA) was tasked by GPU Nuclear Corporation (GPUN) in January 1982, to conduct an independent review of the Three Mile Island, Unit 1 (TMI-1) and the Oyster Creek (O/C) nuclear plants in order to identify areas where improvements could be made which would result in work being performed more efficiently and at less overall expense.

It is our opinion, based on the extensive review conducted, our knowledge of the nuclear utility industry, and our more than twenty-eight years of experience in the nuclear power generation field that, in an overall sense, there are very few functions, activities or work efforts, either being done or contemplated by GPUN, at TMI-1 or Oyster Creek that are unnecessary. We find that in 1979 GPUN embarked on a determined program to create a nuclear utility that had clearly taken to heart the shortcomings of the past, experienced throughout the nuclear industry for the last three decades, and has achieved the capability to demonstrate that it can operate and maintain its nuclear plants safely. It is now in the process of being able to do this efficiently. This effort has not reached the desired end point as yet; there are still a number of areas where further effort is needed. However, our review indicates that, regardless of the level within the organization or the particular area reviewed, there is a universal desire to make GPUN a model of the industry. GPU management has set the goals and has recognized that achieving these goals would be costly, not only in manpower and effort but in dollars. While they evidence concern over these costs and their continuing upward trend, as they should, they show evidence of continued determination. It is our opinion that these goals can be achieved, that costs can be stabilized, and that the organization, with proper direction, can settle down.

One major contributing factor to the comparatively high cost at GPUN is the number of employees, both inhouse and contractors. In comparison to other nuclear plants of similar age and type, the total number of GPUN employees used to operate and maintain their plants is high. Overall yearly expenses are high. In BETA's opinion this is due to a number of reasons. One reason is that in all areas of its operation, the manning was allowed to increase as it had to, in order to fulfill the yet to be fully defined needs of creating a new and unique nuclear corporation. While GPUN management attempted to exercise some degree of control on this growth, the highest priority was given to getting the new organization established, manned and working on the known tasks which had to be done. In doing so, GPUN management had to accept the possibility that overstaffing would occur. Given the alternative of understaffing which would have resulted in goals and objectives not being met, a conscious decision was made. The net result was a tendency to overstaff in order to assure that each function was properly covered. Doing this within tight budgetary constraints did not become a high priority issue within the organization until the beginning of 1982, when some of the elements of the organization began to stabilize and the overstaffing became evident. 1982 can be viewed as the start of the settling out phase of the development of GPUN. While there are still a few areas where a particular group needs to develop further and grow in size, most areas are over-manned.

Another reason can be traced to the very premise upon which GPUN was created. GPU management determined that an underlying objective was to develop an organization which had the capability and resources to perform effectively all those functions considered essential to operate and maintain their nuclear plants safely and efficiently. The very nature of this decision dictated the need to increase rather dramatically the number of people on the payroll. While BETA can find inefficiencies in how some of these functions are being carried out, the basic objectives are sound and not necessarily overdone.

The third reason why GPUN manpower and costs are higher than other plants can be attributed to the fact that GPUN is the owner of the plant that had the accident. It was forced by circumstances to react much more rapidly to all of the new requirements imposed by the regulatory agencies. It was also apparent that GPUN had to show concrete evidence that they were taking immediate and bold actions to prove to all concerned that they were reacting to the accident. This put GPUN in the forefront of the nuclear utility industry in making changes, incorporating new procedures and programs, and generally increasing the scope and depth of their coverage. It could be estimated that GPUN is at least one year ahead of the average of the industry in many of these areas.

The substantial build-up of new people in a relatively short period of time created inefficiencies as is typical in any large industrial/engineering organization. Many new people were hired who were minimally trained or experienced and were put into jobs that were not well-defined. Growing pains had to be expected and they are still in evidence, albeit reduced.

There are a number of comments that relate to the actual conduct of the BETA review, particularly with respect to the changes noted by BETA during the year it took place. The review began in January 1982, and was completed in December 1982. At the outset, BETA concentrated on understanding the GPUN budget process; how it was arrived at; how it was approved; how costs were controlled. This brought the reviewers into direct contact with GPUN top management, namely division directors, other directors and managers. What was noted in these early stages were the following:

- A lack of genuine or serious concern over the budget process and its importance to controlling costs.
- Overly concerned with issues relating to divisional responsibility.
- A lack of sense of total ownership with respect to their role within the overall accomplishment of GPUN objectives.
- Much effort being devoted to adjusting to the new functional organization, creating documents and trying to figure out how work was supposed to get accomplished, and
- Working to assimilate the large influx of new people into their organizations.

Throughout the period of the review, BETA noted significant improvements in each of these. Specific areas where progress was most pronounced were:

- Throughout GPUN, people were taking the budget process seriously. Procedures and programs were established which allowed people to begin to understand the budget process, to track commitments and expenditures, and to influence the rate of expenditures.

- The people who were charged with the responsibility for accomplishing work understood and realized that they had the authority, responsibility and wherewithal of controlling costs. In early 1982, these functions were perceived to be held by the Administration Division.

- For a number of reasons, the management of Oyster Creek, at all levels, dramatically improved. Previously noted problems with attitude at the middle management and worker levels has begun to be turned around and is now more positive.

- There was a marked improvement in cooperation between divisions at the lower levels.

- The attitude of GPUN employees at TMI-1 has remained essentially positive, which, in light of the continuing delays in restart, is an accomplishment.

Notwithstanding the above, there still remains a number of areas where progress has been slow or where significant improvement still needs to be made. These include:

- Productivity throughout the GPUN organization is still at a low level primarily because of the lack of proper supervision, poor planning, cumbersome union agreements and late or incomplete technical support.

- Plant maintenance at Oyster Creek and TMI-1 has yet to reach the point where required equipment reliability can be reasonably assumed.

- Technical support, while improving is still slow, unresponsive to plant needs and too often technically incomplete.

There are a number of actions that can be taken immediately that should result in increased efficiency of the GPUN operation. These are detailed in other chapters of this report but can be summarized as follows:

- Continued pressure by the Office of the President on the Division Directors to strive for more efficiency in their operations.

- Greater effort to force individual managers to make their people more productive and to make better use of GPUN's performance evaluation system.

- Continued effort to reduce paper.

- Continued effort to reduce the small "cells" that have been created.

- Continued efforts by GPU and GPUN to eliminate inefficiencies caused by past provisions contained within the labor agreements and practices.

- Continued effort to force acceptance by the workers of greater responsibility for high quality radiological work performance.

- Review the number of people assigned to the plants who perform strictly administrative work.

- Continued effort to improve the interaction between Technical Functions and the sites.

- Continued efforts to make the operating divisions, in contrast to the support divisions, feel greater responsibility for cost performances across the board, particularly with respect to contracted work.

With respect to GPUN manning, BETA concludes that, for a number of reasons listed below, the current approved level, while it can be reduced in certain areas, can not be reduced substantially in the near term (6 to 12 months) time frame. These reasons relate to:

- Continuation of the need to resolve technical and non-technical issues raised by the regulatory agencies at Oyster Creek and TMI-1.

- The backlog of known technical problems related to the two plants.

- The accomplishment of known maintenance and modification work at the two plants.

- The still-existent lack of maturity of the organization and the lack of experience of many of the relatively newly hired people within the organization.

BETA is of the opinion that a multi-reactor, multi-site, functionally-run nuclear power utility, in the most ideal situation, can be run with a total of 750 utility people per nuclear plant. This assumes a reasonably high degree of inhouse technical capability such as the goal of GPUN. BETA's number for the less than ideal situation is 900 - a number which BETA feels can be scheduled for achieving when major milestones are reached.

There is the need to balance the size of the full-time GPUN employee level with the size of the contractor effort. Extremes in either direction are harmful. The 900 number should allow for GPUN to handle in-house those tasks which arise from what could be described as normal operational situations, whereas outside assistance would be required for unusual or not often repeated circumstances. Based on where GPUN is today, that would

mean a drop of about 200 people. While BETA can, and has identified to the Office of the President where it considers these excess positions exist, a far better approach in the near-term would be for the Office of the President to continue applying pressure on the Division Directors to cut excesses where they are identified, and to remove from their roles those people who are not performing at the expected level. Reductions beyond the 200 or so should be possible in the long term but this decision should be based on a review made when the major work effort has subsided and the organization has settled down.

One further objective of the BETA review was to perform a comparative analysis using cost and manning data from other plants. For a number of reasons, discussed in Chapter XIII of this report, this analysis did not produce the hoped for results. While the comparative data should not be ruled out completely as being meaningless, it is not accurate enough to analyze any specific function, group or cost center. Without intimate knowledge of the other plants, how they function, how they are organized and how they collect and report manning and cost data, it would be foolhardy in BETA's opinion for GPUN to make drastic changes based solely on the accumulated data. There may be some advantage in having a freer exchange of ideas between the manager of a given function in GPUN with his counterpart in another utility if the comparative data indicates a glaring disparity in manning.

CHAPTER II

INTRODUCTION

CHAPTER II. INTRODUCTION

A. OBJECTIVES AND SCOPE

Basic Energy Technology Associates, Inc., (BETA) was tasked by GPU Nuclear Corporation's (GPUN) Office of the President in January 1982, to conduct an independent review of current and projected manpower and overall cost expenses for the Three Mile Island Unit-1 (TMI-1) and Oyster Creek nuclear plants. The review was to cover TMI-2 only to the extent of determining allocation of GPUN resources assigned to TMI-1 and Oyster Creek.

The objectives of the review were to:

1. Determine the appropriateness of performing the functions, activities and tasks currently underway and planned.

2. Make a judgment as to the effectiveness and efficiency of efforts being used to perform those functions, activities and tasks.

3. Perform a comparative analysis, using data obtained from a number of other utilities, to determine if such an analysis might provide meaningful indicators. The data was to cover manpower, operations and maintenance (O&M) costs, capital costs, and general and administrative (G&A) costs.

4. Provide GPUN management with significant impressions throughout the period of the review, and

5. Provide a final report of the BETA findings, conclusions and recommendations.

The findings of the first three objectives listed above are briefly described in Chapter I of this report, "Overall Assessment". Specific findings and recommendations relating thereto are contained in the remaining chapters of this report. BETA provided the Office of the President with interim reports throughout the period of the review outlining significant impressions.

The scope of the BETA effort was to conduct the review in all of the GPUN divisions, with the exception of TMI-2, as previously noted, covering every area, function and activity within GPUN. The BETA review of contractor effort was restricted to interviews of GPUN personnel and records or data in the possession of GPUN.

The comparative analysis involved fourteen privately-owned nuclear utilities located in the United States and included the two GPUN plants. GPUN resources were used to obtain the data from the various utilities, put the data in useable form, and provide the data for BETA to analyze.

B. METHOD OF APPROACH

1. In performing the review as previously outlined, BETA felt there were a number of situations existing within GPUN that had to be

given constant recognition throughout the review period. These were:

a. Constantly Changing Situation. The major reorganization, which occurred less than two years ago, was still in its formative stage. It was a major reorganization, not only in the sense that people were moved, but in very basic terms of organization. A functional organization replaced a typical project organization. Functions, activities and capabilities, heretofore not included within the former structure, were added. The organization grew in size (number of people) over a relatively short period of time.

The BETA onsite review, conducted over a five month period, was still seeing a process of settling down. Correction of organizational interface problems, absorbtion of new people, creation and implementation of new policies and procedures; these were all much in evidence throughout the review period. Many instances of inefficiencies, noted by BETA early in its review, were in the process of correction and were corrected by the end of the review.

b. Creation of GPUN. While the newness of the organization, discussed above, affected the BETA review, the character and complexity of the new organization which had been created also had a marked effect on the review. There are very few, if any, nuclear utilities that have opted to form a totally complete nuclear organization, structured along functional lines. This type of management was being put in place by combining the personnel assets of two owner utilities, Metropolitan Edison and Jersey Central, each of which had headquarters capabilities at different locations, i.e., Reading, Pa., and Morristown, N.J. In addition, there were groups at the GPU headquarters offices in Parsippany, N.J., and at both of the nuclear sites. All of these groups had to be combined into one organizational entity, while continuing to function.

It was also significant to the review that TMI-1 was still in a shutdown condition and undergoing its third year of attempting to get back on the line. A number of critical TMI-1 issues continued to face GPUN during the period of the BETA review including:

(1) Steam generator leak problem.
(2) Psychological stress issue with the NRC and the courts.
(3) The reactor operator cheating issue.
(4) Issues related to obtaining Atomic Safety and Licensing Board (ASLB) and NRC agreement to restart.

Each, in its own way, prevented key GPUN people from devoting their full attention to the task of making the new organization work.

c. The Uniqueness of GPUN. Recognition had to be given to the fact that GPUN was created from elements of the company that had experienced the accident at TMI. While it could be argued that now, after three years, it should not still have an unsettling effect on the organization, its people, and how work is performed, this is not the case. It was apparent throughout the review, that a corporate decision had been made shortly after the accident that GPU would embark on a program to create the best nuclear organization in existence. This aspect is important, particularly in the comparative portion of the BETA review, because it shows that, in many respects, GPU is in the forefront of all of the utilities used in the comparison insofar as achieving an in-house technical capability, and in reacting to outside (NRC and others) suggestions, demands, or requirements. One element of the BETA review was to see if GPUN had overreacted to these pressures.

2. The method of approach, used by BETA in conducting this review, consisted primarily of interviewing a large number of GPUN personnel in order to determine what they considered their job to be, how they performed it, what impediments they faced, and where they felt improvements could and should be made. In conducting this review, BETA was able to take advantage of its past involvement with GPUN (1980, Review of Management Capability and Technical Resources) which provided BETA with a better understanding of the organization and the key people involved.

Prior to conducting the interviews, BETA reviewed the key organizational documents issued by GPUN in establishing the functional roles. Documents and procedures issued by each Division outlining how that Division operated and interfaced with other Divisions were also reviewed. In addition, BETA was provided with a comprehensive description of the new budgeting and cost accounting system, which was in the process of being implemented.

In order to fulfill the objectives of this review, BETA looked into a number of areas including:

a. Determining if the functions, activities, or items of work (O&M and Capital) which are being, or will be, performed are things which should be done, and second, if they are being performed in an efficient manner. This included reviewing:

- 1981 and 1982 work plan and budget
- Assignments of manpower
- Assignments of work
- Planned workload
- Actual workload
- Performance
- Constraints
- Backlog of work
- Overtime

- Rework
- Farm-out work
- Cost and cost control
- Requirements for work
- Paperwork
- Concurrence load
- Decision process

b. Conducting a review of past, current and future manpower and cost figures for GPUN major contractors used at TMI-1 and Oyster Creek in order to assess the reasonableness of the effort and the associated costs.

c. Conducting a review of major capital cost figures for TMI-1 and Oyster Creek.

d. Reviewing the GPUN salary structure to determine if it was nominally in line with the industry and the area.

e. Seeing if it was meaningful to compare returned costs at GPUN and other plants on a number of TMI modifications required by NRC to be done at all nuclear plants that have been done at TMI-1 and/or Oyster Creek.

f. Seeing if it was possible to determine the amount of manpower effort that has been estimated in 1982 for handling matters which might be considered unique to TMI-1 and Oyster Creek because of their close association with TMI-2.

g. Determining how much money is programmed in 1982 for building up repair/spare parts inventory and compare this to previous years.

h. Determining and analyzing turnover and buildup rate of personnel at TMI-1, Oyster Creek and Parsippany for the past year.

3. In conducting the comparative analysis, GPUN management decided they, rather than BETA, would provide the necessary resources to obtain the data from the various utilities. BETA provided GPUN with a list of the types of information considered appropriate for review. That list was refined, and GPUN, in conjunction with one other utility, obtained data from fourteen nuclear utilities. In all cases someone from GPUN or the other utility visited the plant or the headquarters offices of the utility in question.

Upon completion of the data-collecting process, the data was then entered to a data bank so that the various analyses could be accomplished. The analysis of the data and the conclusions derived therefrom, as provided in this report, are those of BETA and are not necessarily those of the persons who collected the data for GPUN.

4. Two in-depth record analyses were performed to determine if a quantitative measure of effectiveness or efficiency could be obtained. In one case, using GPUN people to collect the data, a complete review of available TMI training records covering the period January 1, 1982, through March 31, 1982, was conducted. Data covering the following areas was collected and tabulated:

- Courses planned to be conducted.
- Courses scheduled to be conducted.
- Courses actually conducted.
- Number of students in each class.
- Frequency and duration of each class.
- Instructor for each class.
- Where the class was taught.
- Monitors used for the classes. Who they were and whether reports were written.
- Classroom attendance records.
- Nature of the instruction, i.e., lecture, class notes, study, video tape.
- Tests or examinations given and, if so, what kind, how many, etc.
- Critiques held and reported.
- "Customer" involvement.

The other area subjected to a detailed records analysis was TMI-1 Quality Assurance (QA). The review was based on current written procedures, reports and records available in Quality Assurance, Auditing, Engineering, and Inspection as well as on personal observations of monitorings, audits, and inspections in process. The purpose was to assess the effectiveness of selected control documents and the effort required to process them. Similar to Training, above, the review covered the first three months of 1982, in order to make the following determinations:

- Actions (monitorings, audits, inspections, document reviews) planned.
- Actions scheduled.
- Actions conducted.
- Time spent in preparing for, conducting, and reporting the QA actions.
- Alternatives used when scheduled QA actions were canceled or could not be performed.
- For each QA section, time spent on work other than the principal function, i.e., monitorings, audits, inspections, and document review. Established a percentage for each category of "other work".
- Percentage of Material Noncompliance Report (MNCR's) and Quality Deficiency Reports (QDR's) written in the last three months that had been resolved.
- On the average, the amount of QA time required by each procurement action (procurement specification, purchase requisition, purchase order, receipt inspection, resolution of MNCR's written at receipt inspection).

In both of these detailed record reviews, useful information was obtained pointing up areas where inefficiencies existed. However, neither of the reviews provided a useful means for establishing quantitative measures of work efficiency. It is BETA's opinion that these types of analyses do not lend themselves to determining the efficiency of operations of this nature any more so than work sampling or time studies. More is to be gained by improving the performance of the supervisors.

C. BACKGROUND

In early 1980, the decision was reached by GPU to reorganize and create a new corporation within the GPU system which would encompass all three nuclear plants, TMI-1, TMI-2 and Oyster Creek. A new corporation, called GPU Nuclear Corporation (GPUN), was formed in September 1980, and officially became functional on January 1, 1982. The GPUN Corporation differed from the past organizations in that it was structured along functional lines rather than being project oriented. Under the Office of the President there were established nine Divisions, each with a Director:

Division	Approved Total Number Of Employees (1982)
1. TMI-1	340
2. TMI-2	390
3. Oyster Creek	272
4. Technical Functions	425
5. Nuclear Assurance	265
6. Maintenance and Construction	207
7. Radiological and Environmental Controls	255
8. Administration	526
9. Communications	34
10. Human Resources (not a Division)	34

As of September 1, 1982, there were 2611 employees working for or assigned to GPUN at four locations:

- TMI, Middletown, PA
- Oyster Creek (including Forked River), Forked River, NJ
- GPU Headquarters, Parsippany, NJ
- GPU Service Corporation, Reading, PA

While the 2611 employees are identified as GPUN employees, it should be noted that those belonging to a bargaining unit actually remain on the owner company roles (Met Ed and Jersey Central) because, at present, there is no contract between GPUN and the bargaining units. However, for the purposes of this review, all of these people are considered to be "GPUN employees".

Not included within the 2611 employees are a number of contract (or secunded) employees, who are operating within the functional organization of GPUN, i.e., they are occupying positions within the GPUN framework. In addition, there are varying numbers of contractors who perform work for

GPUN. On July 1, 1982, there were 558 contractor personnel working under GPUN contracts. This work is performed either at the sites, such as in the case of construction or modification work, or at locations remote from GPUN, such as for engineering support. Approximately one-third of the GPUN annual budget is devoted to contractor work.

Due to the functional nature of the organization, the number of people at a given location is a summation of the numbers of employees assigned to each Division located at that site. For example, there are 834 (as of December 1, 1982) GPUN employees located at Oyster Creek, yet only 272 report to the Director, Oyster Creek. The others are assigned the remaining Divisions having responsibilities at Oyster Creek. The breakdown of GPUN manpower by location is as follows:

Location	Employees
TMI-1	750
TMI-2	537
Oyster Creek	834
Parsippany	473
Reading	52

The following is a breakdown of how it was planned to allocate the breakdown of the 1982/3 approved level of GPUN employees by plant assignment.

GPU NUCLEAR STAFFING - 1982/1983
(APPROVED LEVEL)

LOCATION	TMI-1	TMI-2	OYSTER CREEK	GPUN TOTAL
On Site	750	537	834	2,121
Off Site	156	68	261	485
TOTAL	906	605	1,095	2,606

Fossil System Lab Personnel	30
Undistributed Personnel	9
Saxton Manager	1.0
Forked River Support	2.0
Tech. Functions Trainee	11
Overhead Support	5
GPUN SYSTEM PERSONNEL CONTROL LEVEL	2,664

2/3/83

1983 GPUNC MANPOWER RESOURCE ALLOCATION

Division/Department	Oyster Creek			TMI-1			TMI-2				GPUNC
	On-Site	Off-Site	Total	On-Site	Off-Site	Total	On-Site	Off-Site	Total	Other	TOTAL
1000 Office of the President											
1100 Executive Office	--	2.6	2.6	--	1.3	1.3	--	1.0	1.0	9.1	14.0
1100 CORB	--	1.0	1.0	--	.5	.5	--	.4	.4	.1	2.0
TOTAL O/P	-0-	3.6	3.6	-0-	1.8	1.8	-0-	1.4	1.4	9.2	16.0
2000 Oyster Creek Division											
2000 V.P. & Staff	14.0	--	14.0							2.0	16.0
2100 Operations	77.0	--	77.0							--	77.0
2120 Radwaste Operations	33.0	--	33.0							--	33.0
2140 Chemistry	22.0	--	22.0							--	22.0
2200 Plant Engineering	39.0	--	39.0							--	39.0
2300 Maintenance	85.0	--	85.0							--	85.0
TOTAL O.C.	270.0	-0-	270.0			-0-			-0-	2.0	272.0
3000 TMI-1 Division											
3000 V.P. & Staff				2.0	--	2.0					2.0
3100 Administration				1.0	--	1.0					1.0
3200 Site Operations Mgmt.				7.0	--	7.0					7.0
3210 Operations				92.0	--	92.0					92.0
3212 Radwaste				26.0	--	26.0					26.0
3220 Maintenance				159.0	--	159.0					159.0
3230 Chemistry				19.0	--	19.0					19.0
3300 Engineering				29.0	--	29.0					29.0
3400 Plans & Programs				5.0	--	5.0					5.0
TOTAL TMI-1		-0-		340.0	-0-	340.0				-0-	340.0
4000 TMI-2 Division											
4000 V.P. & Staff							3.0	--	3.0		3.0
4200 Site Operations Mgmt.							5.0	--	5.0		5.0
4210 Operations							72.0	--	72.0		72.0
4212 Chemistry							25.0	--	25.0		25.0
4220 Maintenance							121.0	--	121.0		121.0
4240 Plant Engineering							16.0	--	16.0		16.0
4300 Recovery Programs							23.0	--	23.0		23.0
4300 Licensing & Nuclear Safety							21.0	--	21.0		21.0
4500 Recovery Tech. Planning							4.0	--	4.0		4.0
TOTAL TMI-2		-0-			-0-		290.0	-0-	290.0	-0-	290.0

Division/Department	Oyster Creek			TMI-1			TMI-2			Other	GPUNC TOTAL
	On-Site	Off-Site	Total	On-Site	Off-Site	Total	On-Site	Off-Site	Total		
5000 Technical Functions											
5000 V.P. & Staff	--	2.1	2.1	--	1.1	1.1	--	.8	.8	11.0	15.0
5100 Engineering Services	3.0	29.9	32.9	3.0	17.4	20.4	--	7.9	7.9	1.8	63.0
5200 Licensing & Reg. Affairs	6.0	13.4	19.4	6.0	7.4	13.4	--	1.3	1.3	.9	35.0
5300 Engineering & Design	5.0	58.4	63.4	2.0	42.5	44.5	--	2.4	2.4	29.7	140.0
5400 Systems Engineering	19.0	23.1	42.1	21.0	19.6	40.6	--	.3	.3	--	140.0
5500 Engineering Projects	4.0	32.1	36.1	4.0	16.0	20.0	--	2.6	2.6	.3	59.0
5600 Start-Up and Test	11.0	3.4	14.4	13.0	2.6	15.6	--	--	--	--	30.0
TOTAL Technical Functions	48.0	162.4	210.4	49.0	106.6	155.6	-0-	15.3	15.3	43.7	425.0
6000 Nuclear Assurance											
6000 V.P. & Staff	--	5.8	5.8	.5	2.4	2.9	.2	1.9	2.1	.2	11.0
6100 QA/QC	38.0	12.6	50.6	37.4	7.0	44.4	20.6	11.0	31.6	.4	127.0
6200 Training & Education	37.0	2.6	39.6	38.0	1.3	39.3	17.0	1.0	18.0	.1	97.0
6300 Nuclear Safety Assessment	6.0	2.0	8.0	6.0	2.0	8.0	--	2.0	2.0	--	18.0
6400 Emergency Preparedness	5.0	--	5.0	3.5	--	3.5	3.5	--	3.5	--	12.0
TOTAL Nuclear Assurance	86.0	23.0	109.0	85.4	12.7	98.1	41.3	15.9	57.2	.7	265.0
7000 Administration											
7000 V.P. & Staff	--	4.7	4.7	--	2.4	2.4	--	1.7	1.7	.2	9.0
7100 Fiscal & Info. Mgmt.	32.0	21.0	53.0	34.8	10.6	45.4	25.2	17.7	42.9	.7	142.0
7200 Materials Management	31.0	15.2	46.2	36.7	7.7	44.4	26.3	5.6	31.9	.5	123.0
7400 Director & Staff (S,F,S&H)	--	3.1	3.1	--	1.6	1.6	--	1.2	1.2	.1	6.0
7410 Security	54.0	--	54.0	51.0	--	51.0	38.0	--	38.0	--	143.0
7420 Facilities	35.0	--	35.0	26.0	--	26.0	19.0	--	19.0	--	80.0
7430 Safety and Health	5.0	--	5.0	4.8	--	4.8	3.2	--	3.2	--	13.0
7610 Accounting	10.0	--	10.0	--	--	--	--	--	--	--	10.0
TOTAL Administration	167.0	44.0	211.0	153.3	22.3	175.6	111.7	26.2	137.9	1.5	526.0
8000 Communications											
8000 V.P. & Staff	--	.5	.5	--	.3	.3	--	.2	.2	--	1.0
8100 Public Affairs	--	2.4	2.4	5.6	.5	6.1	4.0	.4	4.4	.1	13.0
8200 Public Information	3.0	.5	3.5	4.8	--	4.8	4.7	--	4.7	--	13.0
8300 Special Projects	--	1.2	1.2	2.1	--	2.1	3.7	--	3.7	--	7.0
TOTAL Communications	3.0	4.6	7.6	12.5	.8	13.3	12.4	.6	13.0	.1	34.0

	Division/Department	Oyster Creek			TMI-1			TMI-2			Other	GPUNC TOTAL
		On-Site	Off-Site	Total	On-Site	Off-Site	Total	On-Site	Off-Site	Total		
9000	**Rad. and Env. Controls**											
9000	V.P. & Staff/Rad Engrng.	1.0	2.6	3.6	.6	1.3	1.9	.4	1.0	1.4	.1	7.0
9100	Rad. Controls - TMI-1	--	--	--	52.0	--	52.0	--	--	--	--	52.0
9200	Rad. Controls - TMI-2	--	--	--	15.5	--	15.5	69.5	--	69.5	--	85.0
9300	Rad. Controls - O.C.	75.0	--	75.0	--	--	--	--	--	--	--	75.0
9400	Env. Controls	11.0	4.7	15.7	9.3	2.4	11.7	6.7	1.7	8.4	.2	36.0
	TOTAL R&C	87.0	7.3	94.3	77.4	3.7	81.1	76.6	2.7	79.3	.3	255.0
A000	**Maintenance & Construction**											
A000	V.P. & Staff	--	7.7	7.7	.4	3.7	4.1	--	2.9	2.9	.3	15.0
A100	M&C - Oyster Creek	167.0	--	167.0	--	--	--	--	--	--	--	167.0
A200	M&C - TMI-1	--	--	--	25.0	--	25.0	--	--	--	--	25.0
	TOTAL M&C	167.0	7.7	174.7	25.4	3.7	29.1	-0-	2.9	2.9	.3	207.0
B000	**Human Resources**											
B000	V.P. & Staff	--	1.0	1.0	--	.5	.5	--	.4	.4	.1	2.0
B010	Area Mgr., Parsippany	--	3.7	3.7	--	1.9	1.9	--	1.3	1.3	.1	7.0
B020	TMI Area Manager	--	--	--	5.8	--	5.8	4.2	--	4.2	--	10.0
B030	O.C. Area Manager	5.0	--	5.0	--	--	--	--	--	--	--	5.0
B070	Org. Plan & Dev.	1.0	3.7	4.7	1.2	1.9	3.1	.8	1.3	2.1	.1	10.0
	TOTAL Human Resources	6.0	8.4	14.4	7.0	4.3	11.3	5.0	3.0	8.0	.3	34.0
	TOTAL	834.0	261.0	1095.0	750.0	155.9	905.9	537.0	68.0	605.0	58.1	2664.0

The 1982 GPUN budget, as it was proposed in November 1981, was:

Plant	O&M	Capital	Total ($ millions)
TMI-1	53.6	43.0	96.6
O/C	72.4	79.1	151.5

Because of the further delay of the start of the Oyster Creek major outage into mid 1982, and the desire on the part of GPUN management to reduce expenditures, the official budget was revised as follows:

Plant	O&M	Capital	Total ($ millions)
TMI-1	53.6	40.0	93.6
O/C	60.0	65.0	125.0

Then in February 1982, when the scope of the TMI-1 steam generator repairs became evident and with a delay in the availability of external funding for TMI-2 cleanup, the following allocation was made as the plan for 1982:

Plant	O&M	Capital	Total ($ millions)
TMI-1	74.4	25.0	99.4
O/C	60.0	65.0	125.0

The returns for 1982 will be approximately:

Plant	Est. Returns ($ millions)
TMI-1	83
O/C	102

D. REPORTING OF FINDINGS

In the chapters which follow, BETA has provided a number of specific findings and recommendations which, if taken, should result in a more efficient operation. The chapters are grouped by divisional responsibility.

In conducting the review, it was not always possible to draw a clear line between a finding or observation which, if corrected, would directly lead to a cost saving in contrast to just making an improvement in a given situation. For example, included in the Findings section of this report is the observation that it takes too long to complete a personnel action. On the surface, it may appear that correcting this problem does not necessarily result in saving money. We have taken the position that it does, albeit indirectly. Therefore, all findings which reflect on somehow improving the functioning of GPUN have been included within this report.

The detailed comments and recommendations that follow in this report are aimed at making GPUN more effective and efficient. They should not be interpreted as an attempt to change the overall goals and objectives set by the management.

It should also be noted that due to the nature of the BETA review, which consisted of several hundred discussions with GPUN personnel, a great many minor observations came to light and were discussed, and subsequently action was taken to improve or correct the existing situation. These minor points have not been included in the findings and recommendations which follow. Those which are reported are situations either requiring broader management action or issues where presently approved policy is not being carried out fully.

CHAPTER III

TMI-1 FINDINGS AND RECOMMENDATIONS

CHAPTER III. TMI-1 FINDINGS AND RECOMMENDATIONS

A. GENERAL

The TMI-1 nuclear plant is unique in the nuclear utility business. It has been in a shutdown condition for almost four years, not because of material problems but because it was located adjacent to TMI-2. Since there is little hope that TMI-2 can be restored to an operating condition in the near future, emphasis by many interested and concerned groups has shifted over to the issue of restarting TMI-1. Thus, for all intents and purposes the burden of proving or disproving the ability of GPUN to operate a nuclear facility safely has shifted away from the plant that had the accident, and the burden of proof now rests with its sister plant TMI-1. Without arguing the merits of this philosophy, any review of TMI-1 must accept that situation and attempt to understand the effect it has had and continues to have on the entire GPUN organization.

The outside observer and even the occasional inside viewer has little appreciation for the magnitude of the effort that has faced those who were charged with the task of rebuilding the confidence of the regulatory bodies, the public and even the people directly involved. From the beginning it was apparent that this entire effort would be scrutinized and judged with a skepticism heretofore unheard of in this business. It was clear that major changes would have to be made in every aspect of TMI-1, including management, design, training, technical capability, and organization. Merely dressing up the preaccident situation would not suffice.

BETA's involvement with this process started some eight months after the accident, after the decision had been made by those within the GPU organizations to take those actions necessary to regain not only the required approvals but also the public's confidence in its ability to operate a nuclear plant safely. BETA's role was and has been one of providing GPU management with an ever-present, independent and critical analysis of their efforts. BETA's relationship with GPU has not been a typical customer-client relationship. From the beginning, BETA has been in the unique position of being given complete freedom to probe any area it felt necessary and to report its findings to the highest levels of management. It has never been tasked or directed to perform a function which would undermine its position as a surrogate of an outsider looking in. Similarly, BETA has not been the architect of the changes.

In one of its earliest tasks for GPU, BETA undertook a review of an issue raised by the NRC and the Kemeny Commission relative to the restart of TMI-1. The issue, which was listed as a specific item to be considered by the Atomic Safety and Licensing Board, involved an assessment of GPU's (or Met Ed's) management capability and technical resources. The BETA review of this area began in the fall of 1979, and continued throughout most of 1980. There was substantial interest and involvement by NRC and others in this question which resulted in the issuance of a set of NRC criteria which was to be used to assist in the determination.

While GPU did not use the NRC criteria as specific models to build its new organization, their existence was known and recognition had to be given to the fact that they would be used in making a final judgment on

Met Ed's ability to restart TMI-1. This, along with other pressures and GPUN's own desire to create a totally acceptable organization tended to drive up the number of employees.

Thus, when BETA was tasked in December, 1981, to undertake a review of GPUN to determine if the new organization was functioning efficiently, it had to be done with this background in mind.

In the case of TMI-1, BETA attempted to approach the problem differently from the classical cost efficiency standpoint where each function and the degree to which it was performed would be matched against a hard line official requirement. To do that would be tantamount to assessing against preaccident conditions—the very conditions that have been blamed for the accident. In each instance, BETA attempted to first base its assessment on a level of capability that an outside, knowledgeable person would expect to find which would satisfy the weaknesses identified as a result of the postaccident investigations. Then, once having done that, to see if there were avenues to obtain greater efficiency.

It might be worthwhile at this point to cite an example which illustrates the above. Prior to the accident, utilities generally followed the NRC requirements for selection, training and qualification of operators. This was done, in most cases, by using those NRC requirements and guidance issued in ANS standards in a fairly strict sense. How good a particular utility was was measured by the pass-fail rate of the applicants for the NRC examinations. Little effort or resources were devoted to going much beyond this level of knowledge. A single nuclear plant having 3 or 4 people devoted to this effort was not unusual. Because of the issues raised as a result of the accident, training of operators has become much more important and broader in scope. Today, there are some 50 people devoted to training at TMI. The questions that needed to be addressed were:

1. Is GPUN meeting not only the requirements but also the intent of those requirements so as to satisfy itself that its operators (and others) are properly trained and qualified?

2. Has GPUN gone too far in its efforts to have its people trained, i.e., has it become "gold-plated"?

3. And finally, is what GPUN doing in the area of training TMI personnel being done in a nominally efficient manner or have resources just been thrown at the problem in order to fix it?

BETA reviewed all of the basic elements which today constitute essential functions. These included:

a. Overall management
b. Engineering/Technical
c. Operations
d. Training
e. Maintenance
f. Radiation protection
g. Quality assurance
h. Nuclear safety assessment

i. Licensing
j. Emergency planning
k. Security
l. Facilities
m. Fiscal management
n. Human resources
o. Labor relations
p. Industrial safety
q. Public relations
r. Fire protection
s. Environment

In general, what was found was that in each category, substantial changes had been made resulting in improvements. New people had been added and, in some cases, people had been replaced. With very few exceptions, BETA could find no unnecessary function or task being performed. There were cases where BETA has concluded that efficiencies can be realized and that these functions and tasks can be performed with less people. The specific cases are either detailed in the chapters which follow or have been transmitted orally to GPUN management (Office of the President).

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TMI-1 SITE MANAGEMENT

FINDING III-A

The role of the Director, TMI-1 needs to be clarified and strengthened with respect to his over-all site responsibilities.

DISCUSSION

One major change which came about as a result of the creation of GPUN was that of going to a functional organization. From the point of view of the Plant Director, this meant that instead of essentially being totally responsible for everything and everybody at the site, his direct responsibility and authority was reduced. While the actual shift in responsibility was not that great, the perception was created that the Plant Manager was no longer directly responsible for a number of areas critical to the plant; namely, training, radcon, QA, major engineering, security, warehousing, etc.

As the new functional organization was put into place, much attention was given to the fact that these functions became the responsibility of other Directors. BETA is still of the opinion that this form of functional organization is appropriate and worthwhile, but it also feels that it is the most difficult to make work. Generally, people have little trouble understanding a straight line project organization where there is one person responsible for all aspects of a given unit. It becomes much more difficult when various Directors become responsible for "pieces" of the jobs. The Director, TMI-1 clearly understands this and has made substantial progress in establishing a working relationship with the other Directors. However, there needs to be a better understanding across all Divisions that while all Directors are "equal" on the organization chart, the Plant Director, in reality,

is a little bit more equal. This does not mean that any responsibility is taken away from the other Directors. It means that the Plant Director has the ultimate responsibility to make sure everything or anything that happens at his site works to his satisfaction. If it is not, then he must take it on, working with or through the other Directors. In the final analysis, if something at the site fails to function properly, be it security, training or the like, the Plant Director would, and should, feel responsible. It should not be like the street car conductor who says he's in charge—but in reality, isn't. Only the Plant Director is permanently located at the site and has the ability to see firsthand what is going on. He must be in a position to use whatever resources are available to him to cause proper action, but still work within the framework of the functional organization.

Another aspect of this problem is that there is a tendency for the other Directors to feel not totally responsible for the outcome of the entire effort. For example, other Directors who provide support services to the plant, should not look upon their jobs simply as isolated segments of the whole. If a problem exists at the plant wherein a Division has some element of responsibility, that Division should feel responsible for the total final outcome and not take the position that it has done what was asked for, and if the end product did not happen to come out right, then that was somebody else's fault. There is also little to be gained in spending hours in meetings trying to decide whose piece of the job failed.

While these comments derive not so much from observing the Directors themselves, but from lower levels within the organization, the Directors are responsible for making sure their people evidence the proper support.

RECOMMENDATION

a. As an important ongoing effort the Office of the President needs to reinforce the understanding not only of the various Directors, but also of lower levels in the organization, of just how a functional organization is supposed to work. These actions should include the Office of the President evidencing a greater sensitivity to instances where the functional organization breaks down and using these instances as examples. Similarly, the Office of the President must ensure that it is not weakening the functional concept by directing contrary actions in the name of expediency. As difficult as it may be, every effort should be made to make the organization work, not bypass it when convenient.

b. Efforts need to continue emphasizing that all Divisions, other than the plants, are support divisions. They perform a supporting role to the plants. If the plants did not exist, they would have no job. If the plants do not work right or efficiently, the support divisions are probably not doing their jobs correctly, and they can't pass the blame off.

c. The Directors need to impress on their people that the time has come to stop worrying over, and spending time on jurisdictional issues. There is little to be gained by attempting to put a jurisdictional definition in black and white on every situation that

arises. There will always be grey, undefined areas, where somebody just does the work and doesn't argue about who is supposed to do it.

d. The Director, TMI-1 needs to impress upon his senior people that they need to make the new organization work by using it, not fighting it. They need to understand that people in other Divisions have just as much a stake in successful operation as they do, and that if there are shortcomings, they need to do what they can to help eliminate them, but not to bypass them.

e. The Director, TMI-1, in concert with other Directors, needs to find a way within the current procedures to stimulate a freer flow of discussion between Divisions without having to bring all subjects up to the Director level.

f. The Director, TMI-1 needs to instill in his senior managers the concept that their complaining about corporate policy "upward" is acceptable and encouraged. Complaining "downward" is not acceptable. This comment, while listed under the Director, TMI-1, applies equally to all Division Directors.

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TMI-1 OPERATIONS

FINDING III-B

The positions for five "engineers" presently reporting to the TMI-1 Manager, Plant Operations should be better defined.

DISCUSSION

There are five "engineers" presently reporting to the Manager, Plant Operations. While the functions that this group performs may be necessary and might need to be retained, it should be determined if they were created to serve a specific purpose in the past and if their existence today is still necessary. Based on the BETA review, they are not performing functions which could be truly called engineering. This may be a problem in nomenclature. In BETA's experience, an employee given the title of "engineer" is usally a person with a college degree in engineering and if the job is one which requires it to be filled with an engineer, it is usually an engineering job.

It is also possible that staffs such as this came into existence because of frustration in not being able to obtain necessary work from those organizations assigned the responsibility.

While there are exceptions, every effort should be made to have plant engineering functions performed by Plant Engineering. This will ensure that there is a proper degree of supervision over all engineering work conducted at the site. BETA recognizes there are tasks to be performed outside of Plant Engineering that are best done by people with engineering background and experience. When this is done, great care must be exercised that these groups do not usurp engineering responsibilities assigned elsewhere.

RECOMMENDATION

The five engineering positions reporting directly to the Manager, Plant Operations should be better defined. If they are performing a necessary nonengineering function, such as planning, scheduling, budgeting, etc., then the positions should be redesignated and filled with appropriate people at salaries commensurate with the tasks. If they are truly performing a plant engineering function, then a determination should be made to ensure that the function is not better performed by Plant Engineering.

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TMI-1 MAINTENANCE

FINDING III-C

Maintenance at TMI-1 can improve its support of the plant.

DISCUSSION

The performance of maintenance at TMI-1 has improved significantly during the last two years. However, weaknesses still exist which tend to degrade the quality, quantity, and efficiency of maintenance work. For example:

a. There are 151 people in the Maintenance Department at TMI-1, comprised of 106 work force people and 45 who are in management, supervisory or support positions. In effect, 45 people plan, supervise and account for the work of 106 others. Since 6 foremen and 59 workers are assigned to the six rotating shifts, the daylight maintenance force is comprised of 39 people in management and support positions, with 47 people in the work force. The daylight shift is obviously the main shift, with support available from management, work planning, clerical support, machinists, stores, transportation—all that is needed to make the work move. Yet, a review of maintenance department performance reveals that most maintenance work is done on the two backshifts with 10 workers and one foreman on each. The conclusion has been reached in the Operations Department (the Maintenance Department's customer) that they don't expect to get much work done on the daylight shift—it is too hard, too many people interfere with the work, too many other things get in the way. Much of this is brought about because it is during the dayshift that the heavily manned modification work is performed causing the normal maintenance work to be paper-worked rather than mechanic-worked.

One principal difference between the backshifts and the day shift is in the supervision of the rotating shift maintenance people. At night, the rotating shift maintenance force is under the control of the Shift Supervisor, whereas the rotating shift on day shift is under Maintenance Department management with the regularly assigned daylight shift people. An improvement in efficiency is likely if those in the rotating shift on day shift were assigned to

the Shift Supervisor for accomplishment of jobs less than one shift duration, and those regularly assigned to daylight could undertake the longer duration jobs. This should help abate the feeling in Operations that "nothing can be done on day shift."

b. The BETA interviews of site people concerning maintenance at TMI-1 had a repeating theme that: "Problems do not get solved." There is the perception at the site that repairs are made, the component is returned to service, but the problem that caused the failure has not been solved. Our review indicates that when this situation occurs, it is because Engineering has not been brought into the solution of the problem. This failure to obtain engineering support is a problem in proper supervision, both in the Maintenance Department and Plant Engineering.

c. There is a genuine concern at the site over the contemplated transfer of the corrective maintenance work to the M&C Division. Mr. Arnold's letter of May 27, 1982, to the Vice Presidents directs a realignment of the maintenance function at both TMI-1 and Oyster Creek, whereby the corrective maintenance function will be assigned to the M&C Division. That shift has taken place at Oyster Creek but will not happen at TMI-1 until a date is selected "which will not interfere with restart". Because of the magnitude of the change and the need for stability at TMI-1 at this time, it is recommended that the date selected be later than the currently scheduled restart date. There will be some temporary disruption in the Maintenance Department when the change is made which can be accommodated easier after the current restart effort is completed. Although there are some shortcomings in the current maintenance program, the program is adequate to carry the plant to restart.

RECOMMENDATION

a. Deliberately schedule more work for the day shift. Increase the effort of those in supervisory support positions toward clearing the interferences that slow down work on the daylight shift. Put the same effort into planning and scheduling "tomorrow's" daylight shift as is currently devoted to "tonight's" back shifts.

b. Assign system responsibility in Plant Engineering. Establish the concept of the cognizant engineer. Ensure engineering review and concurrence, and, when thought necessary by Plant Engineering, direction of maintenance actions planned and in progress.

c. Do not make the change of assigning the corrective maintenance function to the M&C Division until after restart of the Unit.

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TMI-1 CHEMISTRY

FINDING III-D

Major deficiencies in the chemistry program at TMI-1 were identified two years ago. Corrections have been slow.

DISCUSSION

TMI-1 has recently reorganized to strengthen the chemistry program. The position of Chemistry Manager has been added. An experienced manager with a degree in chemical engineering has been moved into this position from another job at TMI-1. Efforts are being made to hire two staff chemists to help revise the large number of chemistry procedures and to provide other help in upgrading the chemistry program.

All of the previous chemistry group except its supervisor was moved from Plant Engineering to Operations and Maintenance. The functions of the single chemistry person remaining in Plant Engineering are to provide a day-to-day overview of the chemistry program, to provide interface with others on technical problems, and to help solve chemistry problems. Retaining this chemistry involvement in Plant Engineering is also needed to help ensure chemistry is actively considered in engineering decisions where chemistry has not received enough attention in the past.

RECOMMENDATION

BETA considers TMI-1 is on the right track to upgrade its chemistry program. It is particularly important that the Director TMI-1 have a key manager he can hold accountable for chemistry operations; the chemistry manager should develop this responsibility. It will be more efficient and produce a better product if the chemistry analytical procedures for TMI-1 and Oyster Creek are standardized. The two chemistry managers should take action to force this standardization.

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TMI-1 PLANT ENGINEERING

FINDING III-E

The number of different engineering groups at the site is contributing to loss of efficiency.

DISCUSSION

There are at least 21 different section level groups having engineers at the TMI-1 site reporting to five different Division Directors. This leads to confusion in some cases as to which group will handle a given problem. It causes a slowdown of work due to the need to pass a technical document through a number of these groups before it can be issued. Many of these groups are necessary, and they should be separate. However, it is BETA's

opinion that there are too many of them. As long as the plant has been shutdown this problem has not loomed larger than an inefficient annoyance. The time will soon come when there will be a need for rapid engineering and technical work to be accomplished. Under the present circumstances, this could be hampered by the large number of groups due to the noncohesive engineering structure.

RECOMMENDATION

The various engineering groups at TMI should be reviewed with the goal of reducing the number. In the engineering areas, if there are several different groups within a given division, there should be one person at the site designated as the lead Division representative who would assume the administrative and other responsibilities other than technical.

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TMI-1 RADIOLOGICAL CONTROL

FINDING III-F

There are too many instances where radiological controls are not as good as they should be. The work force has not accepted enough of the responsibility for high quality radiological work performance. Excessive generation of radioactive waste is part of these problems.

DISCUSSION

BETA has been constantly involved for three years at all levels of GPU in upgrading the radiological control program at TMI-1. Since BETA has frequently discussed with top officials its detailed findings and recommendations on radiological controls for TMI-1, an overview will be more useful in this report.

Management support for a strong radiological control program continues to be apparent not just in the words used, but in the allocation of money and manpower. In three years of making improvements, however, the stated objective of a high quality radiological control program standing among the best in the industry has not yet been achieved. As a result, the perception persists that radiological control continues to increase costs and to prevent work getting done. The next steps are essential to increasing efficiency and decreasing time and cost of radioactive work.

There are two fundamental steps in developing a high-quality radiological control program. The first step is reducing to small numbers and to small significance the radiological deficiencies found in routine daily work. The term radiological deficiency is used here to mean anything that could have been done better. TMI-1 has reached the stage where few of its radiological deficiencies are of enough significance to be noted by NRC inspectors. TMI-1 has reached the level where it can be called average in comparison with other utilities in performance of the radiological control organization. Nevertheless, there are far too many deficiencies, there are too many cases of loose control of radioactive contamination, there is too much radioactive waste, and the performance of radiological control personnel

and of radiation workers is often poor. Inevitably, this kind of situation means there will be some important deficiencies. Preventing the big problems requires keeping the small ones under control so that there is time to plan for and to anticipate future events.

This first step may be recognized as the traditional approach to achieving compliance. It can lead to a minimum level of radiological performance where violations of NRC rules are uncommon. Since it relies primarily on a "police force" approach by radiological control personnel, this approach can not by itself raise the radiological work performance to the desired level. There can never be enough "policemen" to prevent the worker from making a mistake. BETA has never observed a high quality radiological control program which has not gone through this upgrading step, but the second step is also required.

This second step is getting the work force and their supervisors to believe that excellent radiological performance is the normal way to work and to demonstrate this belief in their routine work. In theory, this could be independent of step one. In practice, the radiological control organization has to set the example. To achieve this performance requires a radiological control force that believes in getting the work done, that will show the workers how to do it right instead of just stopping what is wrong, that will evolve to more than a "police force". However, the responsibility for this second step is with the work force. The radiological control organization can force step one, but they can only set the stage for step two—they can not make it happen.

The major advantages of a high quality radiological control program do not show up until late in step two. The normal measures of radiological performance need to improve, such as manrem, frequency and severity of abnormal occurrences, personnel contaminations, amount of radioactive waste, and numbers of radiological deficiencies. But then, the feature that surprises many is that cost and time to do work will decrease. There will be less rework. Better planning will pay off in reduced manhours for work performance. There will be fewer events which stop work while senior personnel scramble to resolve problems. There will even be a decrease in size of the radiological control organization.

The status at TMI-1 is that the radiological control organization is well into step one, but the work force is still in early stages of step two. The TMI-1 radiological control group has had a number of changes to strengthen its management. As a result, however, each of the managers in this group is new to his job within the last few months. Only one of the five radiological engineers who are GPU employees has more than one year experience in radiological engineering at TMI-1. There are many improvements needed in the radiological control group, but there are in place systems for identifying these items and the commitment to make the improvements. The greatest need inside the group is to raise their standards for compliance with good radiological practices. At the same time this group needs to make a major improvement in its relations with the work force. The perception that the radiological control group is merely a police force in charge of stopping work has not yet been corrected. When functioning well, this group should be of major help in getting the work done. Further upgrading is also needed in training of radiological control technicians and

foremen to handle unusual situations not covered by written procedures. Such training has recently commenced using seminar sessions for small groups.

In the work force the greatest change needed is to make good radiological performance a natural part of each job. The old negative attitude of operations and maintenance personnel being against radiological controls has been stamped out, but it has not yet been replaced with the needed positive attitude.

RECOMMENDATION

a. Increase the efforts of managers and supervisors to get excellent radiological performance as an inherent part of every job performed by their workers.

b. Improve the working relationships between the managers and supervisors of the radiological control groups and the managers and supervisors of the work force. This requires station management as well as radiological control management attention since a one-sided effort to cooperate will not work.

c. Upgrade the performance of radiological control technicians by improving their ability to identify and report radiological deficiencies.

d. Speed up the correction of radiological deficiencies and increase the attention on solving problems which lead to repetition of deficiencies. Both radiological control personnel and others in the station are required for these efforts.

e. Decrease the numbers of radiological control technicians as the work force picks up its own responsibility for good radiological work performance.

f. New written procedures, new management systems, new committees, and new gimmicks should not be considered necessary to carry out these recommendations. Each one of the recommendations is a logical extension of what has been started and would likely be defeated if buried in new paperwork.

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TMI-1 MATERIALS MGMT
Warehousing

FINDING III-G-1

The warehouse inventory records have enough nomenclature inaccuracies to degrade efficiency.

DISCUSSION

The inspection of Maintenance Department work planning revealed that the warehouse inventory records were inaccurate to the point as to be

considered unreliable by the job planners. The records were used when assembling the material for a job, but only after the planner had been to the warehouse to personally sight the required material—verifying its location and the quantity of stock on hand. This obviously degrades the efficiency of assembling material for the job. In fact, the Maintenance Department has chosen to assign a material runner to assist in locating and assembling material for a job. An inventory of stock on hand has commenced since that initial observation and when completed, should resolve the problem referred to above.

Three months after the inventory referred to above had commenced and was in progress, BETA reviewed the number of adjustments to inventory found to be necessary. The number was surprisingly small. It now appears that the principle deficiency with inventory records at TMI-1 is nomenclature. The stock is not defined with words suitable for letting a user seek out and determine the stock he needs.

RECOMMENDATION

To improve the efficiency of using stock material, a program should be started in close cooperation with the job planning section of the Maintenance Department to verify or revise as necessary the nomenclature used in the inventory records.

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TMI-1 MATERIALS MGMT
Stock Levels

FINDING III-G-2

The amount of stock at TMI is excessive.

DISCUSSION

There are approximately 60,000 line items of stock material at TMI. Approximately 8,000 line items of stock experience some turnover action in a year, while 52,000 line items remain inactive. This inventory could be reduced to improve efficiency and reduce the cost of stores handling. This proposed reduction of stock should be carefully coordinated with maintenance and engineering, since the current usage records, with the plant shut down, are not truly indicative of the need for stores when the plant will be operating. Some recent attempts to reduce stocking levels of infrequently used stock have created material availability problems for maintenance work. BETA reviewed the procedure that is now in use to reduce stock on hand in an orderly and efficient manner, and concurs in the approach. BETA was also informed of plans for selling 10,000 line items of material unique to TMI-2.

Another aspect of stock at TMI is that there is no scheme for purging stock from inventory when technical or administrative requirements prohibit the use of material presently in stock.

RECOMMENDATION

Material that will not or can not be used by TMI should be purged from stock.

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TMI-1 MATERIALS MGMT
Purchasing

FINDING III-G-3

The period of time from preparation of a requisition to delivery of purchased material is too long.

DISCUSSION

Our discussions with maintenance people repeatedly came to the point where concern was expressed for the difficulty encountered and time required to purchase material. In pursuing this issue in TMI purchasing, the problem could usually be tracked to the difficulty in getting a suitable purchase specification or in getting a copy of the ordering data for the previous order of the same material.

Oyster Creek has made significant progress in developing purchase specifications for stock material, but TMI has not.

Progress has been made in microfiching, for the ready reference of requisitioners, copies of previously issued purchase orders and the inventory records have been modified to indicate the previous purchase order numbers.

In spite of the difficulty described above, the trend in warehouse issues and purchasing activity from 1980 to 1981 (no data for 1982 available yet) indicates that the availability of material is improving.

The purchasing concepts of blanket purchase orders, limited purchase orders, and recently restructured local purchase orders are calculated to reduce the effort required of the requisitioner and decrease the time for procurement of small value items. Their use is encouraged.

RECOMMENDATION

To improve the efficiency of purchasing, Plant Engineering should be tasked to prepare a compilation of purchase specifications, approved by Plant Engineering and QA Engineering, for spare parts and consumable stock items for ready use in replenishing stores. The work being done at Oyster Creek should form the basis for the TMI work.

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TMI-1 HUMAN RESOURCES

FINDING III-H

There is a need for the TMI Human Resources group to improve further their responsiveness to site needs.

DISCUSSION

At TMI, under the Director, Human Resources, there is an Area Manager, Human Resources and a staff of fourteen people who handle personnel and industrial relations matters for both TMI-1 and TMI-2. There are five people assigned to industrial relations, seven to personnel and three to the Area Manager. Based on BETA's judgment, this is more people than necessary to carry out the functions assigned. What is of concern, however, are the number of comments made by TMI-1 site people that this group is not responsive to site needs. There were indications that this situation was improving, but still needed improvement. One of the side effects of having too many people to do a given job is that peripheral jobs get created in the form of writing new personnel procedures, studies, analyses, etc., which tend to distract from the original purpose of the group. Several years ago, there was a need to have a sizable Human Resources force at TMI in order to handle the heavy influx of new people. This has slowed down now and it is time to relook at the manning.

RECOMMENDATION

The Director, Human Resources, should review the manning of his TMI group to determine if it is still necessary to be as large as it is. He should also discuss the effectiveness of his TMI group with the TMI-1 Director, to find out ways that his operation can be more supportive of site needs.

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TMI-1 ADMINISTRATION

FINDING III-I

A review of the number of people assigned to administration work at TMI-1 appears excessive.

DISCUSSION

For discussion of this finding, refer to Oyster Creek finding IV.I.

RECOMMENDATION

See Oyster Creek finding IV.I.

CHAPTER IV

OYSTER CREEK FINDINGS AND RECOMMENDATIONS

CHAPTER IV. OYSTER CREEK FINDINGS AND RECOMMENDATIONS

The BETA assessment of the Oyster Creek plant followed guidelines similar to those outlined for TMI-1. The differences came about primarily because of the situation existing at Oyster Creek in contrast to that at TMI-1:

Oyster Creek is an operating plant owned by Jersey Central Power and Light. Jersey Central is part of the GPU system and part owner of TMI, but not responsible for the operation of TMI, whose licensee is Met Ed. Oyster Creek was geographically and organizationally distant from the accident. It was not forced to shutdown as a result of the accident. In some respects its role paralleled that of any other nuclear plant outside of TMI. Once the effort to create the GPUN Corporation was started in early 1980, this role began to change. However, Oyster Creek was not brought under the GPUN umbrella until some time later (September 1980) even though the Oyster Creek people knew it was going to happen.

In BETA's opinion, these differences created conditions at Oyster Creek that were unlike those at TMI-1. For understandable reasons the people at TMI-1 have been more prone to understand the need for and to accept changes than those at Oyster Creek. Also, the people at TMI-1 have been operating directly under the new GPUN system for almost a year longer than those at Oyster Creek, and as a result, are more settled down and comfortable with it. In addition, there were still changes being made in the organization and in key personnel assignments at Oyster Creek throughout the period of the BETA review, a period when preparations were also underway for a major outage. In short, Oyster Creek lagged TMI-1 in having in place those organizational entities upon which BETA made its TMI-1 assessment. Recognition had to be given to this fact.

Another aspect that bears upon Oyster Creek differently than at TMI-1 relates to the material condition of the plant itself. Oyster Creek is five years older than TMI-1. At the time of the accident Oyster Creek had ten years of operation whereas TMI-1 had five. Oyster Creek is a BWR while TMI-1 is a PWR; this inherently makes Oyster Creek a more difficult plant to maintain because of the larger extent of radioactivity throughout the plant.

As a result of TMI-2 post-accident requirements by GPUN, maintenance gained added attention and Oyster Creek found itself with a fairly large backlog of maintenance work. This, coupled with two potentially serious plant technical problems (sparger and torus) that could require extensive work, caused the outage, originally scheduled to begin in 1982, to increase in scope.

There are more GPUN people assigned to Oyster Creek than to TMI-1 (1119 vs 919). The 1983 proposed budget (current status) for Oyster Creek is $155.8 million vs $85.6 million for TMI-1. These differences are reflective of the situations previously

described, but principally due to the Oyster Creek outage now scheduled to start in February 1983.

It was within this framework that BETA conducted its review. As in the case of TMI-1, BETA found, with a few exceptions, no function, task or work effort that was being performed unnecessarily. Many functions and people were still in the early stages of development and, because of that, functions were being performed by people who did not yet have a clear understanding of what needed to be done. It is also significant that over the past two years Oyster Creek has had four different plant directors. This alone was cause for unrest and confusion.

Throughout this period of change it was essential to maintain the proper level of key personnel experienced with and qualified on the Oyster Creek plant. This had to be done, and it was. But it has had a slowing down effect on management's ability to bring new people into the organization.

In an overall sense, there are more avenues to improve efficiency at Oyster Creek than at TMI-1, but they will be more difficult to achieve in the near term because of their earlier stage of development. It is also apparent that even when the 1983 major outage is completed at Oyster Creek, there will still be a significant backlog of maintenance and modification work remaining to be scheduled for the following outage. This will further delay the day that Oyster Creek could be characterized as being in a normal, settled down condition of operation.

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O/C SITE MANAGEMENT
Role of the Director

FINDING IV-A-1

The role of the Director, Oyster Creek needs to be clarified and strengthened with respect to the overall site operation.

DISCUSSION

This finding is similar in nature to that at TMI-1. While there are differences in degree, the same recommendations apply. At Oyster Creek there is a tendency for the Director and his managers to focus on problems and areas under their direct control to the exclusion of problems of other groups which also affect the plant. BETA could see improvement in this situation during the period of the review. However, there needs to be a greater understanding at all levels of management responsible for overall site operation. In the early stages of the BETA review there was noticeable infighting at the site, particularly among groups reporting to different Divisions. This infighting evidenced itself in finger pointing, lack of cooperation and, in some cases, malicious bypassing and stalling to hold up work. We found few groups who held other groups in high regard. In late 1982, when BETA returned to Oyster Creek to check on its findings, this situation had changed considerably for the better.

While there has been improvement, efforts to correct this situation need to be continued because the net result is that work still takes an inordinate amount of time to accomplish. It has also resulted in the swelling of the rolls as each group feels the need for more people to either enhance their position or to do work normally done by others.

This problem will not disappear overnight and will not be solved by ordering it so. The Director, Oyster Creek can and should have a direct hand in correcting this situation by first working on the managers (all of them) assigned to the Oyster Creek site. His interests should be universal and not division-oriented. This problem exists in all areas throughout the site.

While the recommendations which follow are identical to those provided for TMI-1, there are differences mostly brought about by two situations:

1. Oyster Creek lags TMI-1 and consequently, has further to go to achieve its goals. This is further impeded by the waning, but still present feeling at Oyster Creek, that they are "outsiders" in the GPUN organization.

2. Oyster Creek is the lead plant on shifting maintenance from the plant to the newly formed M&C Division at the same time the plant is beginning a major one-year outage. It is going to take Herculean effort on the part of the Director, Oyster Creek and the Director, M&C and their managers to make this work, particularly in a productively efficient manner.

RECOMMENDATION

a. As an important ongoing effort the Office of the President needs to reinforce the understanding not only of the various Directors, but also of lower levels in the organization, of just how a functional organization is supposed to work. These actions should include the Office of the President evidencing a greater sensitivity to instances where the functional organization breaks down and using these instances as examples. Similarly, the Office of the President must ensure that it is not weakening the functional concept by directing contrary actions in the name of expediency. As difficult as it may be, every effort should be made to make the organization work, not bypass it when convenient.

b. Efforts need to continue emphasizing that all Divisions, other than the plants, are support divisions. They perform a supporting role to the plants. If the plants did not exist, they would have no job. If the plants do not work right or efficiently, the support divisions are probably not doing their jobs correctly, and they can't pass the blame off.

c. The Directors need to impress on their people that the time has come to stop worrying over, and spending time on jurisdictional issues. There is little to be gained by attempting to put a jurisdictional definition in black and white for every situation that arises. There will always be grey, undefined areas, where somebody just does the work and doesn't argue about who is supposed to do it.

d. The Director, Oyster Creek needs to impress upon his senior people that they need to make the new organization work by using it, not fighting it. They need to understand that people in other Divisions have just as much a stake in successful operation as they do and that, if there are shortcomings, they need to do what they can to help eliminate them, but not to bypass the organization.

e. The Director, Oyster Creek in concert with other Directors, needs to find a way within the current procedures to stimulate a freer flow of discussion between Divisions without having to bring all subjects up to the Director level.

f. The Director, Oyster Creek needs to instill in his senior managers the concept that their complaining about corporate policy "upward" is acceptable and encouraged. Complaining "downward" is not acceptable.

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O/C SITE MANAGEMENT
Plans and Programs

FINDING IV-A-2

The functions now performed by Plans and Programs could be accomplished more efficiently.

DISCUSSION

Reporting to the Director, Oyster Creek is a function entitled Manager, Plans and Programs with a staff of five people. The BETA understanding is that this group is to assist the Director in matters involving interface between the plant and other Divisions, keeping track of commitments by others affecting the plant and establishing the requirements by the plant for the accomplishment of key events to plant approved cardinal date schedules. BETA acknowledges that this is a useful function and that useful information is provided to the Director. However, as currently functioning, BETA concludes that, in some respects, it is redundant.

The risk associated with having a group like this reporting directly to the Director is that they will assume, and to an extent have assumed his mantle—becoming authoritative and regulatory in their contacts with other functional groups. Better that this group kept totally complete records and status of plant commitments, displaying requirements, obtaining commitments from other Divisions and other plant departments, and following up to determine problems that will be of concern to the Director.

For example, establish key events and cardinal dates for issue with the authority of the Plant Director, but do not specify or schedule the actions required by others in meeting cardinal dates for key events. BETA encountered too many instances where resentment, antagonism, and recalcitrance was being induced by the actions of Plans and Programs in attempting to schedule and direct work which is the responsibility of other departments or divisions to accomplish. Obviously, Plans and Programs must

be aware and be capable of recognizing problems that will interfere with proper and timely completion of key events, but they are not, nor should they be, staffed or qualified to regulate the functions of others.

RECOMMENDATION

a. Hold the size of the Plans and Programs section to its current size for establishing key events, cardinal date schedules, and status of progress and problems.

b. Do not use Plans and Programs as a line authority organization scheduling and directing work, rather as a service organization identifying problems and assisting the Plant Director in his dealings with other division directors, as these problems relate to performance in accordance with existing commitments, key events and cardinal dates.

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O/C OPERATIONS

FINDING IV-B

There is a lack of involvement by Operations in Oyster Creek operator training.

DISCUSSION

As previously indicated, Oyster Creek is about one year behind TMI-1 in having its training program in place. One of the problems encountered and solved at TMI-1 was a lack of involvement by Operations in the training program. This same problem is in evidence at Oyster Creek.

RECOMMENDATION

The Director, Oyster Creek should make whatever adjustments are necessary to ensure that Operations is more involved in the Oyster Creek training programs, especially operator training.

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O/C DECONTAMINATION

FINDING IV-C

Workers do not pick up after themselves.

DISCUSSION

A large part of the work of the decontamination group has been cleaning up after workers. Although there have recently been some improvements, the performance of workers in this area is worse than BETA has observed elsewhere. This sloppiness increases the work of the decontamination group, increases the generation of radioactive waste, increases radiation exposure,

spreads radioactive contamination, and increases costs and time to do work. It has also been one of the causes behind the excessively slow improvement in radiological performance of the work force.

RECOMMENDATION

- Managers and supervisors need to keep on their workers so that it is uncommon, rather than routine, to leave a mess at the end of a work period.

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O/C MAINTENANCE

FINDING IV-D-1

The ability to perform maintenance on the plant in order to assure a reasonable degree of reliability needs substantial improvement.

DISCUSSION

This is a broad but important issue. The BETA review was conducted during a period of drastic change and one that is still in its early stage of development. In October 1982, the primary responsibility for the performance of maintenance work was shifted to the Director, Maintenance and Construction and away from the responsibility of the Plant Director. This is a new concept and it is being inaugurated coincident with the start of a major one-year outage. BETA will not dwell on problems which were evident before the change took place but will concentrate on high-lighting areas that appear to be causing difficulties today and particularly those associated with the transition. A number of the problems cited existed prior to the transition and appear to still exist.

Even though BETA will confine its comments to the transition period, it is worthwhile to understand the situation leading up to the present. At the time of BETA's initial review at Oyster Creek in April 1982, various excuses were advanced to explain the poor material condition of the plant such as: a lack of engineering support during maintenance, clumsy design with difficult access or durability, poor chemistry control, inadequate cathodic protection, etc. However, the fact remains that the maintenance roll was large and the material condition of the plant was poor. The backlog of corrective maintenance job orders was ever increasing, the rate of accomplishing preventive maintenance was a fraction of that planned, and the same maintenance problems recurred. In spite of the large Plant Maintenance Department, heavily staffed with supervisors, engineers, and clerks, the M&C Division was maintaining about 80 contractor mechanics on site during nonoutage periods to perform essential jobs that could not be accomplished in the required time or with the required capability by Plant Maintenance. Easing the Maintenance Department's load by assigning a large Site Facilities group, staffed with utility workers to accomplish maintenance tasks not directly related to the generating plant, has been useful, but not to the extent that Plant Maintenance was producing the desired material condition.

There were several groups at Oyster Creek categorized as maintenance: Corrective Maintenance, Preventive Maintenance, Facility Maintenance, Maintenance and Construction, and Site Facilities. Altogether, there were approximately 350 people in these organizations during nonoutage periods—all with responsibility to maintain the plant, and yet, the plant was not being adequately maintained. Hearsay examples of maintenance job orders being reported complete when no work had been done, of temporary fixes that lasted a week, of repeated occurrence of the same material problem, or of long delays before starting required maintenance were cited by operators. While most complaints were in the mechanical area, there were sufficient examples in electrical and I&C to make it an across the board issue.

During the period of our initial review, the Maintenance Department was under the management and supervision of people who, with a few exceptions, have been at the plant during the entire time that the situation described above developed and persisted. These are valuable people because of their knowledge and experience with the plant, but they were not maintaining or improving the material condition of the plant.

GPUN has since realigned the maintenance function in October, 1982, placing mechanics, electricians, instrument technicians and their direct supervision under control of the M&C Division which will accomplish work requested by the plant. It was GPUN's intention that the total number of people performing maintenance under this new arrangement would not be increased. M&C will need to find the work methods and procedures to improve the utilization of mechanics in working off the backlog of maintenance work and keeping up with new job orders.

The illusion exists within some quarters of GPUN that the maintenance problem at Oyster Creek is a fundamental problem growing solely out of the union "problem" which has resulted in the manual effort in the field never being properly controlled and that, because of the union, nothing has ever happened to increase the effectiveness of hands-on work. If this is so, it leads to a conclusion that the work force and the union agreement must be restructured. BETA agrees there are serious problems with the labor-management agreement which require immediate attention and which, if resolved, would assist in improving efficiency and productivity; however, there are other considerations, not restrained or affected in anyway by the agreement with the bargaining unit.

It was BETA's observation that the union agreement by itself did not have a major bearing on the productivity of the workers. With the possible exception of a few people with malicious intent, who, if existing, can be easily found and discharged, workers will do a day's work. Their efficiency and utilization does not depend on them—rather on their supervision. The worker will do what he is told to do, what he is shown how to do, what he is trained to do, what he can do given the access, special tools, special clothing, plant conditions, tag outs, work permits, procedures, materials, inspection support, radcon support and supervision that are required. Deprive the worker of any of these, and his efficiency and productivity declines. He will then do what he is told to do or what he is allowed to do. So, to blame inefficiency and lack of productivity on the worker is a poor excuse--even to blame it on his group supervisor is sidestepping the issue. The group supervisor's work ethic is much like that described above for the

worker. Even he must be put in an environment and be provided with the procedural, material and management support conducive to doing work. Put him in an environment where he can not work, and he and his gang will accomplish nothing. Concentrate the effort on those who generate the work requirements and create the work environment, and manage the work within the existing contract, while negotiating to improve any features of the bargaining unit agreement which prove to be inhibiting.

All of these items discussed so far are well-known to both the Plant Director and the Director, M&C. They are areas that need to be addressed and solutions found if maintenance work at Oyster Creek is to improve. In addition, BETA has noted a number of problems associated with the transition that also need correction. BETA understands that whenever such a drastic change takes place there will always be a period of time that people are unsettled, confused and working at odds. This is to be expected. However, BETA senses a fundamental lack of understanding on the part of fairly senior people (managers) involved of just how this new arrangement is supposed to work, particularly in the details. A very detailed procedure has been written and issued which, at least at this stage, is not fully understood by those charged to carry it out. As the system attempts to be used, roadblocks are encountered and there doesn't appear to be a mechanism to bring the right people together to resolve the holdup.

For example, there is a large backlog of installation procedures held up awaiting PORC review (a subject discussed elsewhere in this report). This is a step in the sequence of events, one of many, that needs to be resolved if it is taking an inordinate amount of time. Without arguing the whys, it is essential that the issue get resolved and this can only be done by people enpowered to make decisions. As the plant moves further into the outage and the large workload begins, many more of these types of problems are going to arise.

RECOMMENDATION

a. Senior people in M&C, including the Vice President, the Production Director and the Manager of Planning should increase their direct and daily participation in solving organizational and divisional interface problems arising at Oyster Creek as a result of the transition. This recommendation is not to be interpreted as a means to force decision-making upward or to usurp the responsibilities of those people at the site. Rather, it is recommended as a means to obtain quick resolution of problems that may be beyond the reach of those at the site. At this stage of development there are probably very few people who have a clear understanding of how this new organization is intended to work. The few that do, need to be put in the breech.

b. In concert with the above recommendation, other senior people at the site such as the Vice President, Oyster Creek, the Manager, RadCon Oyster Creek, the Manager, Oyster Creek QA, and the senior T/F site representative need to increase their personal involvement in resolving the time-consuming roadblocks arising as a result of the transition.

c. Care must be exercised not to assume automatically that the large number of newly prepared procedures relating to the conduct of maintenance at Oyster Creek are, or will be, understood by those required to follow them. Initial observations indicate that some of these procedures may be overly prescriptive.

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O/C MAINTENANCE
Coffee Breaks

FINDING IV-D-2

The sanctity of coffee breaks at Oyster Creek is a sizeable contributor to poor productivity.

DISCUSSION

The agreement with the bargaining unit specifies one fifteen minute coffee break. It does not specify when the break is to occur. Rarely is the break completed in the specified period of time or at a time that would have the least effect on work. In addition, it is now common practice to take a coffee break in the afternoon, with no reference in the bargaining unit agreement. Again, that break is seldom completed in fifteen minutes or taken at an appropriate time. Should these two breaks be taken by workers involved in areas requiring protective clothing, at least two hours of nonproductive time results.

RECOMMENDATION

a. Undertake to negotiate the morning coffee break out of the bargaining unit agreement or at least allow management to decide when the break is to occur.

b. Eliminate the afternoon coffee break or allow management to determine if, when, and under what conditions there will be an afternoon break.

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O/C MAINTENANCE
Working Hours for
Contracted Employees

FINDING IV-D-3

Mechanics under contract through M&C do not stay on the job until the end of normal working hours.

DISCUSSION

The current practice is to release M&C contractor employees from the job in time for them to be off Company property by the end of working hours. The explanation of this unusual practice was that they come to work

on their time, but leave work on Company time. This is an added cost, and it also has a bad effect on the Company employees who are supposed to stay on the job.

RECOMMENDATION

M&C contractor employees should be kept on the job until the end of working hours.

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O/C MAINTENANCE
Preventive Maintenance

FINDING IV-D-4

Only a fraction of the preventive maintenance routines planned for accomplishment are completed.

DISCUSSION

The relatively new preventive maintenance program at Oyster Creek has made progress—the program was started from zero. For instance, the rotating screens at the intake structure are now lubricated on a schedule, rather than only when rebuilt after failure.

With the transfer of the maintenance function to M&C, the preventive maintenance function will stabilize. Previously, when needed, preventive maintenance workmen were diverted to corrective maintenance work. This is the principal deterrent in accomplishing planned preventive maintenance.

At the time of our initial review in April 1982, job planning was still done manually by engineers on the Preventive Maintenance staff. When the program is automated in the Generation Maintenance System (GMS), this work can be done cheaper with job planners, and the engineers can be released to engineering work.

RECOMMENDATION

a. Expedite loading the preventive maintenance system schedule in GMS.

b. Maintain close contact with TMI-1 Preventive Maintenance in order to benefit from TMI experience.

c. Consider reducing the size of the Preventive Maintenance Manager's staff as the preventive maintenance program stabilizes.

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O/C MAINTENANCE
Mobile Maintenance

FINDING IV-D-5

Mobile Maintenance is a costly way to perform plant maintenance.

DISCUSSION

One of the loosely, or informally, controlled expenses is the cost incurred through the use of the Mobile Maintenance force maintained by JCP&L at a remote station. Portal to portal pay—including overtime for that in excess of 8 hours, mileage, meals, mealtime, motels, per diem, etc., cause the effective hourly rate for Mobile Maintenance employees to far exceed that of a plant employee or an M&C contracted craftsman. Apparently, requests for Mobile Maintenance people are made orally—no real scope of work definition is required. If Mobile Maintenance can provide the requested people, they will be provided at their exorbitant cost. If they can not be provided, the plant must go through the administrative burden of trying to reschedule the work before starting the job with mechanics under contract to M&C. Using Mobile Maintenance people under these conditions is disruptive to work planning and destroys any attempt to control costs to the budget. (Budgets are prepared at the plant payroll rate, not the inflated Mobile Maintenance rate).

The manner in which costs are accrued by Mobile Maintenance and the informal controls over the use of this high cost service create a disregard for cost in those who use Mobile Maintenance. It might have been a good idea ten years ago, but today it doesn't work, except for specialty tradesmen, such as turbine overhaul specialists.

Any Mobile Maintenance people with unique Oyster Creek skills who perform most of their work at Oyster Creek could be taken up on the plant rolls to reduce these abuses.

RECOMMENDATION

a. Consider negotiating agreements which result in better utilization of Mobile Maintenance.

b. Consider taking on to the M&C roll those Mobile Maintenance employees who perform most of their work at Oyster Creek.

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O/C CHEMISTRY

FINDING IV-E

Problems in performance of the chemistry control program at Oyster Creek were found to be similar to the problems at TMI-1.

DISCUSSION

The same actions are underway at Oyster Creek as described in the previous section for TMI-1 chemistry; they are not repeated here. An experienced manager has recently been hired from outside GPU to be chemistry manager.

RECOMMENDATION

BETA considers Oyster Creek is on the right track to upgrade its chemistry program. It is particularly important that the Director, Oyster Creek have a key manager he can hold accountable for chemistry operations; the chemistry manager should develop this responsibility. It will be more efficient and produce a better product if the chemistry analytical procedures for TMI-1 and Oyster Creek are standardized. The two chemistry managers should take action to force this standardization.

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O/C PLANT ENGINEERING
Engineering Groups

FINDING IV-F-1

There are too many separate, section level groups having engineers at Oyster Creek.

DISCUSSION

Our review indicates that there are at least nineteen section level groups having engineers onsite at Oyster Creek operating under the direction of five Division Directors. Many of these are necessary and should be separate. However, it is our opinion that there are too many. There are such groups in each of the following:

1. Under Director, Oyster Creek

   a. Manager, Programs and Controls
   b. Plant Operations Director
   c. Manager, Plant Operations
   d. Manager, Radwaste
   e. Plant Engineering
   f. Manager, Plant Materiel

2. Under Director, Technical Functions

   a. Licensing
   b. Plant Analysis
   c. Plant Process Computer
   d. Engineering Projects
   e. Start-up and Test

3. Under Nuclear Assurance

   a. Quality Control
   b. Quality Assurance
   c. Welding
   d. Safety Review

4. Under Director, Radiological and Environmental Controls

   a. Radiological Engineering
   b. Environmental Control

5. Under Director, Maintenance and Construction

   a. M&C Technical Support

Because of this, there is often confusion as to just which group or groups will handle a given problem, which in turn, adds to the time it takes to resolve a problem. It also creates a situation where one group thinks another group is handling a problem while, in fact, nobody is. It also results in there being 80 engineers located at the site.

RECOMMENDATION

The number of separate engineering groups at Oyster Creek should be reviewed with the goal of reducing the number. This should also result in reducing the need for having 80 engineers at the site. Where there exists a need to have multiple engineering groups, there should be one person at the site designated as the lead Division representative who would assume the administrative and other responsibilities other than technical.

* * * *

O/C PLANT ENGINEERING
Nuclear & Core Management

FINDING IV-F-2

The projected manpower level is high for the Oyster Creek Nuclear and Core Management group.

DISCUSSION

The onsite Nuclear and Core Management group at Oyster Creek has been authorized to expand its manpower to six engineers in 1983. At the present time there are three engineers filling those positions. Oyster Creek

has had difficulty in finding people willing to stay in those jobs, primarily because they feel the job is too narrow. The workload for this group, assuming they do not duplicate offsite functions, could be reduced so that it would not require a staffing level of six. It is understood that partial justification for this level is to support shift operations for such events as power level changes, startup, data taking, etc.

RECOMMENDATION

a. Operating procedures should be prepared that will reduce the dependence on the Core Management group during planned plant evolutions and during periods of taking data. It is understood that forthcoming plant changes (cycle 10 outage) will simplify the procedure requirements.

b. Action should be taken to assure that the Oyster Creek Core Management group does not duplicate efforts of the Nuclear Analysis and Fuels section in the Technical Functions Division.

c. Reevaluate the staffing level of the Core Management group.

O/C RADIOLOGICAL CONTROL

FINDING IV-G

There are too many instances where radiological controls are not as good as they should be. The work force has not accepted enough of the responsibility for high quality radiological work performance. Excessive generation of radioactive waste is part of these problems.

DISCUSSION

The findings and recommendations on radiological control for Oyster Creek are summarized here in words similar to those for TMI-1. The discussion section under TMI-1 radiological control is not repeated here but it provides useful background information for Oyster Creek.

There is a more urgent need to improve the radiological control program at Oyster Creek than at TMI-1 for the following reasons:

a. The consequences of not having a good radiological control program at a boiling water reactor are worse than at a pressurized water reactor because there is more radioactivity spread throughout more systems and throughout more routinely occupied areas.

b. Major radioactive work in the long outage now just beginning at Oyster Creek.

c. Correction of the poor attitude toward radiological controls has not progressed as far at Oyster Creek as at TMI-1. Neither the work force nor radiological control personnel perceive that the radiological control organization should be helping to get the work done. Productivity is worse at Oyster Creek than at TMI-1 and radiological controls are blamed as a major cause of this low productivity of the work force.

d. The radiological control organization at Oyster Creek has been slower in developing radiological engineering competence than at TMI-1. Many of the radiological control technicians at Oyster Creek have been contractors, while TMI-1 has seldom used contractors for these jobs. These situations mean that it has been hard for the radiological control organization to exercise the leadership needed in getting the radiological work performed with good radiological control.

RECOMMENDATIONS

a. Increase the efforts of managers and supervisors to get excellent radiological performance as an inherent part of every job performed by their workers.

b. Improve the working relationships between the managers and supervisors of the radiological control groups and the managers

and supervisors of the work force. This requires station management as well as radiological control management attention since a one-sided effort to cooperate will not work.

c. Use a radiological awareness committee similar to that at TMI-1 to help in accomplishing these first two recommendations.

d. Upgrade the performance of radiological control technicians by improving their ability to identify and report radiological deficiencies.

e. Speed up the correction of radiological deficiencies and increase the attention to solving the problems which lead to a repetition of deficiencies. Both radiological control personnel and others in the station are required for these efforts.

f. Decrease the number of radiological control technicians as the work force picks up its own responsibility for good radiological work performance.

g. Commence promptly the training of radiological control technicians and their first line supervisors to handle unusual situations not covered by written procedures.

h. New written procedures, new management systems, and new gimmicks should not be considered necessary to carry out these recommendations. Each one of these recommendations is a logical extension of what has been started and would likely be defeated if buried in new paperwork.

* * * *

O/C NUCLEAR SAFETY REVIEW
Plant Operations Review
Committee (PORC)

FINDING IV-H

Senior management people at Oyster Creek are spending too much time on PORC matters.

DISCUSSION

BETA was informed by several members of the PORC that they spend twenty hours or more a week in PORC meetings at Oyster Creek. The members of the PORC are key management people at the site who are responsible for areas requiring their daily attention. By spending so much of their time in PORC meetings, the plant is deprived of their services. It was also reported that some of the items reviewed by the PORC are of minor significance which should not require that level of review. It was also indicated that the PORC is spending much time rewriting poorly prepared documents. These two actions result in placing a heavy demand on the members.

RECOMMENDATION

A review should be made of the Technical Specifications to determine if the present wording is such that it requires PORC to review documents beyond the recognized scope considered appropriate, or if minor items are being PORC reviewed because of local interpretation. Action should be taken to expedite the changes made at TMI-1 for conducting independent onsite safety review. In addition, poorly prepared documents which are submitted to the PORC for review should not be rewritten by the PORC, but returned to the author for correction. Once the people understand that the PORC will not do their work for them, the documents will be better prepared. The Director, Oyster Creek, should expedite these actions in order to free up his key management people from excessive time spent in PORC so they can perform their normally assigned jobs and to eliminate the excessive delays when documents are held up pending PORC review.

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O/C ADMINISTRATION

FINDING IV-I

The number of people assigned to administrative work at Oyster Creek appears excessive.

DISCUSSION

There are 48 GPUN people at the Oyster Creek site that fall in the category of Administrative Support/Services. These are broken down as follows:

Building Services/Facility Maint	4
Emergency Planning	1
Quality Control	1
Licensing	1
Training & Education	3
M&C Planning & Scheduling	3
M&C Field Const	1
M&C Tech. Support	2
M&C Admin. Support	3
Contract Admin.	2
Procurement/Purchasing	2
Computer Operations	2
Document Control	11
Industrial Safety	2
Personnel	5
Word Processing	4
Plant Admin.	1
TOTAL	48

In addition, there are 56 GPUN employees at the Oyster Creek site identified as Clerical/Secretarial Services. These are assigned to the following groups:

Management/Mgmnt Support	10
Senior Control Room Operator	1
Radwaste	2
Start up & Test	1
Plant Maintenance	1
Building Services	3
Planning & Scheduling Engineering	.5
Emergency Planning	1
QA	3
QC	1
Nuclear Safety Review	1
Licensing	1
Training & Education	3
Environmental Control	1
HP	.5
Radcon	2.5
M&C Planning & Scheduling	1
M&C Tech Support	1
M&C Admin Support	4
Contracts	1
Procurement	1
Storeroom/Warehouse	1
Plant Project Engineering	1
Budget & Cost Analysis	8.5
Industrial Safety	1
Personnel	2
Security	1
Plant Admin.	1
TOTAL	56

These two categories of employees account for 104 employees. It appears to BETA that this number is larger than necessary to carry out the onsite tasks. There is no single area where large numbers of people are assigned, and in each individual case, a logical argument could be made for there being a person or so assigned. It is the total number that leads to the belief that excesses exist. Elsewhere in this report, there is discussion on the building up of individual staffs. It is suspected that a number of the positions listed above fall in that category. It is difficult for BETA to recommend just which of these positions could or should be eliminated. Collectively, six Divisions are responsible for these 104 people. It would appear that a number of the functions or tasks they perform could be combined and shared; however, this would require some give and take on the part of six Division Directors.

RECOMMENDATION

The six Division Directors involved with providing the 104 administrative/clerical positions at Oyster Creek should be advised that the total number of these two types of positions onsite at Oyster Creek will be reduced. The Office of the President should set an arbitrary number.

NOTE: This item has equal applicability at the TMI-1 site where there are 106 employees in the categories of administrative support and clerical services.

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O/C MATERIALS MANAGEMENT
Purchasing

FINDING IV-J-1

The purchasing operation at Oyster Creek is receiving inadequate clerical support.

DISCUSSION

In connection with the previous comment concerning excessive clerical personnel at Oyster Creek, there are situations where required clerical work is not being adequately performed. This situation is an example of where under-utilized clerical people are not being assigned useful but possibly onerous functions at the site. At the time BETA conducted the review of Purchasing at Oyster Creek, in April 1982, purchase requisitions were being received at the rate of 75 per week. At that same time, there was a backlog of 111 requisitions awaiting typing. In the previous section of this report, BETA comments on the excessive number of clerical and administrative support positions at Oyster Creek, yet in Purchasing, the support is scant. BETA was subsequently informed of procedures and methods to reduce the backlog and preclude recurrence by processing some Oyster Creek requisitions in Parsippany. With the increased purchasing activity associated with the upcoming outage, the efficiency of purchasing would be improved if the necessary clerical support were onsite—provided from excessive clerical people already present.

RECOMMENDATION

Consider reassigning lightly loaded clerical people to Purchasing to support processing of requisitions.

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O/C MATERIALS MANAGEMENT
Warehousing

FINDING IV-J-2

The stores and warehouse function at Oyster Creek can improve its support of the plant.

DISCUSSION

Past performance of the warehouse at Oyster Creek was inadequate. Even for items said to be in inventory, difficulty in locating and issuing was frequently encountered. A recent inventory has revealed large quantities of direct turn over (DTO) material on hand, as well as errors in the stock records, complicating the warehousing job.

The inventory is now on-line, low limits are specified for automatic reorder. Shelf-life items are identified, and a workable program for preparing ordering data for stock and spares is in process in Plant Engineering.

The usefulness of the improvements in warehousing will be enhanced when the CRT terminals giving access to inventory records are installed in the plant.

The next step which should be undertaken in the warehouse is warehouse assistance in staging material for jobs scheduled to start soon. In this concept, warehousemen would assemble the material for a job and have it ready for issue on a job basis rather than on a line-item-of-material basis.

RECOMMENDATION

a. Expedite installation of CRT's in the plant to give direct access to inventory records.

b. Carefully plan the disposal of direct turn over material on hand that is not required for plant support.

c. Consider undertaking staging of material on a job basis.

* * * *

O/C MATERIALS MANAGEMENT
Accounts Payable

FINDING IV-J-3

Delays in processing invoices for payment are creating significant problems for Purchasing.

DISCUSSION

At the time of the BETA review in April 1982, the Purchasing Manager was encountering situations in which suppliers were demanding Cash on Delivery or payment by certified check prior to shipment. One supplier had established a pattern of filing a claim in Small Claims Court simultaneously with submitting his invoices. All of this is a distraction and decreases the efficiency of the purchasing operation.

BETA was informed of steps taken and of plans in process intended to solve this problem and of progress made to date.

RECOMMENDATION

The backlog in Accounts Payable should be promptly eliminated.

CHAPTER V

NUCLEAR ASSURANCE FINDINGS AND RECOMMENDATIONS

CHAPTER V. NUCLEAR ASSURANCE FINDINGS AND RECOMMENDATIONS

GENERAL

The creation of the Nuclear Assurance Division is probably unique within the nuclear community. It brings together in one division three separate groups whose independence from the day-to-day operation is an important ingredient. It encompasses Quality Assurance (QA), Training and Education (T&E), and Nuclear Safety Assurance (NSA). At the time of its establishment QA was for all intents and purposes, a fully functioning group operating out of the Met Ed (TMI) organization. About two years after the accident, Oyster Creek QA was folded into this group. While there has been a sizeable effort to make the GPUN QA more effective and cohesive, it was essentially a going organization at the time the Nuclear Assurance Division was formed. From the time of its first involvement with GPU in early 1980, BETA has been impressed with the management of the QA program, its depth of experienced people, its philosophy of coverage, and the support it received from the corporate level.

Under the current task, BETA did not find, nor did it expect to find glaring deficiencies or flagrant cases of over-coverage. The question which was addressed was whether or not the present QA management was doing its share to create the most efficient operation while at the same time not compromising its high principles. In the early stages of its review BETA did conclude that not as much effort was being devoted to this aspect as should have been. Over the ensuing months it became apparent that this situation changed for the better. QA management has instituted a number of changes which will result in obtaining the proper amount of QA/QC coverage but with less people. This effort should continue.

The Training and Education Department was and is a different story. A major issue arising out of the accident at TMI-2 was training, particularly operator training. As a result, a major effort to create a comprehensive training program at TMI was initiated. But unlike QA, it had to start from a rather meager base. An organization which at one time consisted of less than six people had to be expanded in a short time. Nonexistent training programs and courses had to be created, and new people had to be assimilated. At the same time this was going on, the same leading people were needed to prepare testimony and give it for the legal proceedings. If this were not enough, the problem coming out of the operator examination cheating incident arose. Circumstances dictated that key members of training management devote considerable effort in attempting to resolve this problem. A further complication was the need to institute a vigorous training program at Oyster Creek.

What BETA found in the Training and Education Department was what was expected in view of the circumstances. When compared with the state existing in 1979, significant progress had been made and was continuing. However, there were many situations where it was apparent that a given program had been conceived and work started, but, due to lack of management attention and the lack of qualified and experienced people, the goals and objectives of the program were falling short. It would appear that too many things were being attempted, in too short a time, with untrained people,

and where full management attention had been diverted to other things. This is one area within GPUN where the program sorely needs the opportunity to settle down.

The third element of Nuclear Assurance is Nuclear Safety Assurance. Even though this department was incorporated into NA at the time of its formation, it was not staffed at the headquarters level for the first year. Subsequently NSA provided the corporate framework for establishing the newly imposed requirement that there be an independent onsite safety review group (IOSRG). The functioning of NSA has just recently started and the effort to staff it continues. BETA found it too early to assess the effectiveness of the TMI-1 IOSRG, and such a group has not yet been formed at Oyster Creek.

As a note of explanation, when BETA began its review in January 1982, the System Laboratory located in Reading, Pa., was organizationally under the Director, Nuclear Assurance. Midway through the review the laboratory was shifted to come under the Director, Technical Functions. BETA's findings relative to the System Laboratory are covered under Technical Functions.

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N/A READING GROUP

FINDING V-A

The group presently assigned to Nuclear Assurance located at Reading should be eliminated and the functions reassigned to Parsippany.

DISCUSSION

There is a group of three people located at Reading who report to the Director, Nuclear Assurance and handle budgeting and administrative functions for the division. There is no reason related to GPUN work performance for this group to be located in Reading and the fact that they are there rather than at Parsippany is an inefficiency.

RECOMMENDATION

Consider eliminating this group at Reading and reassigning the functions to Parsippany.

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N/A CORPORATE TRAINING
Development Courses

FINDING V-B-1

There are many training and development courses offered which are useful but not essential.

DISCUSSION

It is BETA's opinion that GPUN training resources should be focused more on resolving known and immediate problems directly related to the nuclear power plants. To do otherwise only dilutes the effort from those important areas.

A review of the GPUN Training and Education Course Catalogue (dated March 25, 1982) shows thirteen Management Development Courses offered; some on a voluntary basis. They are:

1. Management Development Program
2. Communications: Process in Perspective
3. Decision Analysis Course
4. Effective Writing
5. Effective Writing, Phases 2 & 3
6. Dynamics of Face-to-Face Communication
7. Leader Effectiveness Training
8. Listening: Sharpening Your Analytical Skills
9. Scientific Analysis of Ideas: Communications Course
10. Basic Supervisory Development Program
11. Fundamentals of Supervision
12. Supervisory Training for Managers
13. Perception: Key to Effective Management Communication

While a case could be made that every one of these courses is worthwhile and would improve the effectiveness of GPUN, it is BETA's opinion that many of them, as presently structured, are not essential. There should be a course, or possibly two given to employees who are, for the first time, being put into a supervisory position. Such courses are necessary and are discussed elsewhere in this report dealing with supervision. As far as the other courses are concerned, each Division Director and his managers should bear the responsibility for training their own people on matters such as how to perform their job more effectively. The Training Department could be tasked to prepare course material for these subjects which would be available to Division Directors to use in informal, non-classroom type of instruction. It is BETA's opinion that having Training perform this function creates a number of bad side effects:

a. It tends to relieve supervisors of their responsibility.
b. The courses are viewed as a nice place to go for a rest.
c. Because of the nature of some of the courses, it is possible that the people teaching the course know less than the students.

d. It creates a problem for some of the senior managers who, for whatever reason, will not let their people attend these courses, and then are viewed by their own people as being against company policy.

RECOMMENDATION

Review the courses offered in Management Development with the aim of eliminating those which do not materially contribute to the safe and efficient operation of the GPUN plants.

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N/A HEADQUARTERS TRAINING EFFORT
Effectiveness

FINDING V-B-2

The headquarters training group is not concentrating enough on coordinating plant training efforts.

DISCUSSION

In the GPUN functional organization there is a headquarters group responsible for training. This group is headed by the Director of Training and Education who reports to the Vice President-Nuclear Assurance. Reporting to the Director of Training and Education there are three managers: a manager for plant training located at TMI, a manager for plant training located at Oyster Creek, and a manager for corporate training located at headquarters.

The functions and responsibilities of the two site managers are clear, and while there remains more work to have these site organizations operate effectively, at least the direction they are headed is correct. BETA questions the direction being taken by the headquarters group, including that of Corporate Training. BETA does not question Corporate Training's responsibility for training GPUN personnel located at Parsippany. This is an appropriate task. What is questioned is an apparent lack of headquarter's coordination of site training. BETA expected to find a headquarters group that kept track of what was going on at the sites to make sure efforts were not being duplicated or that the two sites were not going off in different directions. Very little of this was found. One contributing cause for this was GPUN's inability to fill the Director of Training and Education position for most of 1982. As a result, the responsibilities of this position have been divided between the Vice President-Nuclear Assuranace and the Manager of Corporate Training. A further distraction was the assignment of the Vice President-Nuclear Assurance to the TMI-1 Steam Generator Task Force in February 1982, which reduced the amount of time he was able to devote to training.

Assuming these complications did not exist it is still BETA's opinion that the headquarter's role in training, as described above, is not being pursued to the extent that it should. Whether this function belongs in Corporate Training or with a separate staff assigned to the Director of

Training and Education is not the issue. The issue, as far as BETA is concerned, is that there are people in the headquarters organization that could be doing this function but they are not.

RECOMMENDATION

The goals and objectives of the headquarters training and education group should be reviewed to ensure that higher priority is given to carrying out the function of coordinating and overseeing the efforts of the two site training groups.

* * * *

N/A TMI-1 TRAINING
Scheduling

FINDING V-B-3

There are inefficiencies in the TMI training effort due to a lack of meaningful scheduling. The Training Department has difficulty in obtaining data to schedule its training.

DISCUSSION

Based on interviews conducted and a detailed review of the records, BETA concludes that inefficiencies in the TMI training program are brought about due to the lack of a realistic schedule. It should be possible, at this stage of events at TMI-1 and in the Training Department, to develop a one year training schedule which can be generally adhered to, especially with respect to start dates for classes. Consultation between TMI-1 and the Training Department should result in knowing that, during the next year, there will be so many classes taught to licensed and nonlicensed operators, requalification, etc. With this information, Training should be able to develop a long range schedule that makes the most efficient use of the instructor staff.

This is particularly evident in the case of Security Training, wherein a number of classes were held with just one student. The argument was advanced that the Security people never knew ahead of time when a new security person would be hired. Thus, Training was always put in the position of having to train someone on short notice and of doing it inefficiently. A simple change could be made wherein Training would schedule four (or some number) of Security classes per year, starting on fixed dates. It would then be encumbent on Security and Human Resources to have new hires available on those dates.

RECOMMENDATION

All divisions involved with having people trained at TMI and the TMI Training Department should arrive at a realistic training schedule that covers one year ahead. This will require these divisions to feel some degree of responsibility for whatever inefficiencies they create by not providing useful data or by being insensitive to the needs of Training.

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N/A TMI-1 TRAINING
Attitude

FINDING V-B-4

There is an overly "understanding" attitude which prevails in the TMI Training Department, especially with respect to operator training.

DISCUSSION

Interviews conducted by BETA in March and April 1982, indicate that there existed an attitude, not only within the TMI Training Department, but also at the plant, of almost patronizing the students. There seemed always to be excuses why students did poorly, why operators made mistakes, or if there were cheating, why it occurred. It appeared that the Training Department had become very "understanding" of all the problems the students may have and, as a result, lacked the degree of toughness, accountability, and insistence on performance needed in the nuclear profession. In a follow-up review conducted in November 1982, BETA found this situation improved but not entirely corrected. While there is merit in making the task of learning as easy as possible for the student, our experience indicates that the student must be challenged; he must feel some pressure to exert himself; he must have some apprehension over not doing well. While these concepts may differ from the so-called "modern" form of education, we contend that they work.

The students are being paid a good salary to learn, and they need to be told what is expected of them and then to be held accountable. For example, having students evaluate their instructors may be an essential part of modern education, but it tends to put the student in a position to justify his own lack of initiative and sense of responsibility. Instructor evaluations should be conducted by the training staff or other elements of the organization, such as Operations or Technical Functions.

All elements within GPUN concerned with training have been put under a lot of pressure over the past three years as a result of the TMI-2 accident and then the exam cheating incident. There have been groups, committees, etc., auditing, reviewing and analyzing the TMI training program. While most of this could not have been avoided, care must be taken that it has not caused attitudes to develop within the Training Department that can result in a less than optimum product. In its review, BETA did not attempt to make a first-hand determination of the quality of the training effort. For example, we did not attempt to find out if licensed operators were being taught the correct material in quality or quantity. However, in our attempt to make some judgment on the efficiency of the operation, we did have an opportunity to talk to the training staff, the students and the product users. Based on this, it is our opinion, that too much emphasis is being placed on proving to the world that the training program is good and not enough on doing what should be done to produce a competent operator. The Training Department needs to settle down, get back to what they know their job is, and concentrate on that, rather than constantly looking over their shoulder wondering what it is they are doing wrong.

RECOMMENDATION

a. To the extent possible, GPUN management should resist bringing in more outside groups to review the training program. There are ample means within GPUN to do this.

b. Now that the outside pressure has abated somewhat the Director, Training and Education, should direct the efforts of the TMI Training Department to concentrate more on producing the best product they know how, and less on trying to prove it.

c. Greater effort should be spent on making the students more responsible for their own performance.

* * * *

N/A TMI TRAINING
Instructor Supervision

FINDING V-B-5

There exists a lack of supervision of instructors in the TMI Training Department.

DISCUSSION

During the time of the BETA review of TMI Training, a number of instances were noted indicating that the training staff lacked needed supervision. In some cases, it was because supervisors, who were present, did not react to situations where instructors were not performing their assigned tasks. Based on these observations, such lack of reaction appears typical of the normal mode of operation within the training building. Had this not been the case, the job inattention noted would not have been as obvious and distracting. In other cases, it was noted that there just was not any supervision present.

It would seem that this finding should be unnecessary considering the seniority and experience level of the training staff. However, BETA was alerted to the possibility of this condition by a number of comments made by GPUN people outside the Training Department. The main thrust of these comments applied to the lack of supervision over the instructors in the classroom. BETA was not able, or in a position to observe instructor performance in the classroom, nor would it have provided the necessary atmosphere to make a meaningful judgment. However, based on the observations made, there should be concern over classroom performance.

Instructor performance, good or bad, has a lasting effect on students. If instructors demonstrate a lack of interest in their jobs in any way, this is transmitted to the students. As far as BETA is concerned, this is another indication for the need for a more tightly run Training Department.

RECOMMENDATION

a. There are 15 supervisors in the 53-man Training Department at TMI. This is a much higher ratio of supervision to workers than normal. The Manager, TMI Training, should review the basic principles of supervisor responsibility with his supervisors.

b. It is BETA's opinion that the Manager, TMI Training, creates the impression that he is inaccessible to his staff by the location of his office in the Training Building. While he should have a private office, it might be better if that office were located out in an area where he could see his staff, and they could see him.

c. When the Manager, TMI Training and the Operator Training Manager are both absent from the Training Building, someone should be designated in charge and assume the responsibility to monitor what is going on in the Training Building.

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N/A O/C TRAINING
Effectiveness

FINDING V-B-6

Findings reported on TMI-1 Training have applicability at Oyster Creek.

DISCUSSION

In the BETA review of GPUN Training, a conscious decision was made to concentrate the effort on TMI-1. While a cursory review was made of Oyster Creek training, it was felt that since the TMI-1 training program had received a greater share of attention for a longer period of time, it would, therefore, provide a more realistic basis for review. However, it is BETA's opinion that each of the findings and recommendations contained in this report relating to TMI-1 Training also have applicability at Oyster Creek. In this connection, it is noted that there appears to be very little communication or interplay between TMI-1 and Oyster Creek training. There seems to be an attitude that "if we didn't do it, it isn't any good". We saw numerous cases where each site was developing its own procedure, document, plan, etc. For example, there has been an identified problem in chemistry training at both sites for a long period of time. Yet, at the time of the BETA review, there was almost no interaction between the two sites on this subject.

It is also BETA's opinion, based on its cursory review of Oyster Creek training that, as in the case of TMI-1, more attention is being paid to the "trappings" of training rather than to a concerted effort on obtaining an effective end product.

RECOMMENDATION

a. Headquarters Training and Oyster Creek Training should review the findings and recommendations contained in this report listed

under TMI-1 Training and consider them for applicability to Oyster Creek.

b. Headquarters Training should establish a mechanism which forces TMI and Oyster Creek Training Departments to communicate, cooperate and interact with each other as a matter of routine.

* * * *

N/A QUALITY ASSURANCE
Engineering

FINDING V-C-1

There are more Quality Assurance engineers than necessary to carry out the requirements contained in the GPUN Operational Quality Assurance Plan.

DISCUSSION

The Operational Quality Assurance Plan states that the Manager, Quality Assurance Design and Procurement shall, among other duties,

...

"1.6.1.2c. Review and accept design control procedures prepared by other organizations when these procedures control or exercise an effect upon important-to-safety systems, components or activities."
and
"1.6.1.2g. Review engineering specifications and procurement documents to assure quality requirements are incorporated."

Similarly, at the plants, the Manager, Quality Assurance Mod/Ops shall, among other dutes.

...

"1.6.1.3d. Review engineering specifications and procurement documents to assure quality requirements are incorporated."

BETA concurs with these assigned duties as reasonable and appropriate. It is BETA's perception, however, that the QA engineering groups go significantly further, reviewing not only specifications, but also drawings and procedures. For instance, M&C installation procedures, as well as the engineering specifications on which they are based, are receiving QA engineering review prior to release. Likewise Plant Engineering or Technical Functions resolution of QDR's and MNCR's receive QA engineering review and concurrence prior to release.

BETA considers that many of the QA engineering reviews and approvals currently occurring beyond that specified in the OQA Plan are redundant and delay the accomplishment of work. After approval of the engineering specifications and the material procurement documents, the burden shifts to the engineering and work performance groups who are also bound by the OQA Plan. The functions of QA Engineering at this point should be to provide assurance to those managers not in the QA organization that the

OQA Plan is being complied with. This could be done by sampling procedures and drawings already approved by Tech Functions and Plant Engineering and M&C procedures implementing engineering specifications.

The current QA reviews do serve useful purposes, however. It is during these reviews that the plans for future monitoring are developed and in which the QC hold-points are determined and specified. The review of procurement documents allows for developing receipt inspection planning and procedures. Likewise the review of engineering resolutions of MNCR's and QDR's allows the proper planning of the necessary reinspections. Also, QA reviews are frequently sought by the PORC as an assist to the PORC's review and approval. All of these considerations lead to extensive QA reviews. None can be said to be unnecessary or meaningless, but all become one more hurdle in the issue of approved procedures and working documents.

The thrust of this item is to encourage the development of plans wherein QA reviews, other than those required by the OQA Plan are performed simultaneously with ongoing work, rather than sequentially in the preparation of work procedures.

RECOMMENDATION

As Tech Functions, Plant Engineering, and M&C mature, consider reducing the number of engineers assigned to QA Engineering.

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N/A QUALITY ASSURANCE
Operations

FINDING V-C-2

There are too many people assigned to Ops QA for the expected decline in the future workload.

DISCUSSION

Operations Quality Assurance (Ops QA) provides direct assistance to the operations, maintenance, and engineering supervisors performing important-to-safety work, usually by objectively monitoring work in process and providing observations to the supervisor of the work. This function is of value to the Company, particularly in light of the training and detailed knowledge of the QA Plan on the part of the Ops QA monitors. The issue is the extent to which this service is provided. As the Company becomes more stable and mature, the value of extensive monitoring is decreased.

RECOMMENDATION

Consider reducing the number of Ops QA monitors as the work force stabilizes and matures. To phase down the size of this group, consider not filling vacancies, when occurring.

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N/A QUALITY ASSURANCE
Manufacturing Assurance

FINDING V-C-3

The Manufacturing Assurance section is larger than is required for known future work.

DISCUSSION

In the future, the need to purchase large quantities of important-to-safety material will be reduced as the modification work at TMI-1 and Oyster Creek approaches completion. This should reduce the level of effort required in the Manufacturing Assurance section and should permit reducing its size.

RECOMMENDATION

Consider reducing the size of the Manufacturing Assurance section as the manufacturing effort associated with the recent large modification efforts decrease.

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N/A QUALITY ASSURANCE
Operational Quality Assurance Plan

FINDING V-C-4

There is a risk associated with the new Operational QA Plan.

DISCUSSION

No specific fault is found with the new Operational QA Plan--even the NRC accepted the Plan without comment. Certainly, the Plan, as a plan, is not bad, and fits the often stated intent of the President of having the best Quality Assurance. During the interview phase of this assessment, however, an undefined, not clearly stated concern and worry on the part of many in the Company was expressed regarding the complexity and workability of the new Plan. Since the Plan is complex and forcefully worded, it will be important during the implementation phase to exercise the finest judgment to avoid paper wars, work stoppages, and organizational conflicts. A well-engineered, objective, supportive implementation of this Plan will enhance the Company's performance.

RECOMMENDATION

The QA Director must stay closely involved during the implementation phase. His best judgment will be required.

N/A QUALITY ASSURANCE
TMI-1 QA

FINDING V-C-5

The TMI-1 Quality Assurance Department creates the illusion in the minds of others that the Department is not supporting the plants.

DISCUSSION

We frequently encountered senior people in GPUN who felt that the QA Department was not responsive to the absolute need for QA support. The opinion was expressed that the QA Department was not urgently concerned with resolving problems and clearing deficiencies. Some felt that QA was unnecessarily interfering with the accomplishment of work.

Although it was disconcerting to encounter these feelings and opinions in important people, BETA can not, in fact, based on close dealings with TMI-1 QA personnel, confirm the opinions of others expressed above. It is important, however, that such feelings do exist, and they must be overcome. BETA believes progress is currently being made in disabusing people of such concepts of the QA Department. As long as such feelings do exist, however, QA will remain in an adversary role, rather than the support role intended.

RECOMMENDATION

a. The Director, Quality Assurance should recognize that these feelings exist. He should make an effort on his own, talking to various senior people in other divisions, to find out the basis for these feelings. It would then be encumbent on him to find out what is causing this problem, to take the necessary corrective action in his own department, and to work with the senior people in other divisions to determine if there is something they can do to ease the problem.

b. The Vice Presidents should ensure that their people support the Corporation's Operational Quality Assurance Plan. In this instance, "support" does not mean simple compliance with the letter of the law, rather "support" means believing in the Plan.

CHAPTER VI

TECHNICAL FUNCTIONS FINDINGS AND RECOMMENDATIONS

CHAPTER VI. TECHNICAL FUNCTIONS FINDINGS AND RECOMMENDATIONS

GENERAL

Of all of the Divisions, Technical Functions (T/F) was the most difficult to establish and to get productive, not because of its uniqueness, but because of its departure from the past in two significant areas. One was that it assumed line responsibilities and the other was that it was given the task to build an in-house technical capability where little had existed previously. This meant assembling a group of over 200 engineers by bringing together the nuclear engineering resources of Met Ed, GPU Service Corporation and, later, Jersey Central. But it also meant hiring from the outside a large number of its group. Doing this would probably have been accomplished without too much difficulty if there had been a one or two year hiatus on work, thus allowing the new organization to form and become somewhat capable. Instead, heavy demands were placed on T/F as if it were a fully operational group and this resulted in technical work needed at the sites to fall further and further behind. It is also significant that the demands during this period were abnormal. At TMI-1, in addition to all of the design changes resulting from the accident (TMI Lessons Learned), the steam generator tube leakage problem had to be faced and resolved. At Oyster Creek the engineering workload increased significantly because of the sparger and torus problems, in addition to the numerous repair problems.

Other Divisions within GPUN had to face many of the same problems but not with the same intensity. Either they were organizations which essentially already existed such as in the case of the plants, or their services were not as time sensitive to plant operation, such as Maintenance and Construction (M&C). For example, if M&C did not reach full capability for two years, which it didn't, the plants did not have to do without a maintenance capability albeit less effective. The same could be said of a number of other divisions. However, T/F had to produce and do it during a period of rapid growth.

Essentially, this is what BETA found in its review of T/F. It found an organization struggling to get its work done with a lot of new people still trying to figure out what their jobs were. It found top management within T/F having to spend an inordinate amount of time solving day-to-day problems that a mature organization would be handling in a routine manner. It found T/F management still attempting to put in place methods of operation suitable for running a large 250 man engineering force in contrast to their past experience of running smaller groups and depending more on outside contractors.

The situation was further complicated by the one year or so taken to incorporate Oyster Creek engineering into T/F. Prior to the formation of GPUN, there existed a relatively small but knowledgeable group under Jersey Central at their headquarters location in Morristown, New Jersey. For the first year of T/F's existence, it primarily concerned itself with TMI-1 and TMI-2 problems allowing the group at Morristown to continue handling the Oyster Creek work. In May 1981, the Jersey Central engineering group was moved to Parsippany and came under more direct control of T/F. Because of their unique knowledge of BWR technology, they could not be distributed

throughout the new T/F organization and were set up as a separate group. This is one reason why today there exists a large Oyster Creek contingent in Engineering Projects. Anomalies such as this are being worked out and progress is being made.

The situations described above are not cited to indicate that the decisions were wrong or untimely, but to provide an understanding of the problems that had to be faced. It will take more time for T/F to mature into an effective, smooth running organization. The specific findings which follow reflect some of the problems BETA considers essential to solve in reaching that point.

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T/F OVERALL EFFECTIVENESS

FINDING VI-A

The overall effectiveness of T/F in supporting TMI-1 and Oyster Creek is lacking.

DISCUSSION

In order to achieve an efficient operation at the two plants, it is essential that there be timely and competent engineering support. When this does not occur jobs will not be done properly, there will be much rework, the plants will suffer and costs will be high. This generally characterizes the situation existing today. It is more pronounced at Oyster Creek than at TMI-1.

There has been a noticeable improvement in this situation over the past two years and further evidence of improvement can be seen. There are many factors, previously discussed which contribute to T/F's inability to support the plants effectively. Most prominent is the newness of the organization, new people learning their jobs and the large backlog of problems facing the new organization. As T/F matures, BETA expects to see continued improvement. The purpose of this finding is to point out a number of basic areas that BETA considers are not being resolved within T/F at the needed pace or in a proper manner.

T/F has over 250 engineers and technical people devoted to TMI-1 and Oyster Creek. That is a sizeable engineering force to manage. It takes people who are capable of directing the efforts of many, multidisciplined groups, ensuring that all the elements that go into creating a productive engineering force are handled. This includes such things as:

a. Hiring
b. Training
c. Work assignment
d. Organization
e. Scheduling of work
f. Work performance evaluation
g. Customer needs/satisfaction
h. Cost performance

i. Contracting

It is BETA's opinion that the management of T/F has not grown or matured at the same rate that the size or needs of the organization have grown. Management is still attempting to function as if T/F were a small, independent, call-me-if-you-need-me group of offsite engineers. It has not developed the capability to use effectively the large number of people now in place. High level managers become so engrossed in daily technical issues that the bulk of the engineering talent is left to fend on its own without sufficient direction. Managers need to learn how to stay involved in the technical details but not to the extent that their people are deprived of direction.

The organization has not learned how to discipline itself to meet commitments with a quality product. Achieving this is not just a matter of hiring more engineers. In fact, it is BETA's opinion that very few people should be added to T/F until the present organization can demonstrate it can manage what is already there.

Ultimately, T/F should be in a position to be the leading professional group within GPUN. It should be respected by the other Divisions for its technical competence and for its ability to solve technical problems at the plants before they become causes of lengthy shutdowns and delays. Today this has not happened, particularly at Oyster Creek.

RECOMMENDATION

a. Hold the size of T/F to about where it is for the present.
b. Look at how to enhance the capabilities of the various levels of management of T/F to run a large engineering group.
c. Seek outside help if necessary to provide assistance to T/F management in learning how to run a large engineering group.

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T/F ENGINEERING SERVICES
Procedure Changes

FINDING VI-B-1

It is too hard and takes too long to get a Technical Functions procedure changed.

DISCUSSION

The principal problem in the Engineering Procedures and Standards group is that it takes too long to get a change issued to a procedure. The feelings of others in Technical Functions are that since the procedure "can't" be changed, and since it "won't work" as written, the procedure is simply ignored. Responding promptly to change requests is a large part of establishing the authority of procedures and of building a memory into the system.

RECOMMENDATION

Respond to change requests to Technical Functions procedures promptly.

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T/F ENGINEERING SERVICES
Engineering Cost Analysis

FINDING VI-B-2

The Engineering Cost Analysis section is not analyzing costs.

DISCUSSION

The service currently provided by the Engineering Cost Analysis section is vital to the proper functioning of the Division, but the effort is not devoted to the principal reason for the section's existence—cost estimating and analysis. This section spends essentially full time interfacing between Technical Functions and the accounting systems.

The normal accounting methods used in the GPUSC computer system (COMEC) of advance bookings, invoices rolled forward, and journal entry corrections (vital to the Treasury function) serve to generate confusion in the management of a project or activity. Since the business information currently made available by COMEC, does not help make work management decisions, the Engineering Cost Analysis section is required to devise and construct other business reports that are useful to work managers. Fortunately, the section is able to do this, but only with significant effort which detracts from the primary function of estimating and analyzing costs.

The Director, Fiscal and Information Management has been making efforts to resolve this problem.

RECOMMENDATION

Concentrate the effort of the Cost Analysis section on cost estimating and cost analysis. Get this group out of the cost reporting business.

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T/F ENGINEERING SERVICES
Design and Drafting

FINDING VI-B-3

Drawings have not been revised to show completion of modification work.

DISCUSSION

The availability of corrected drawings, showing changes made to systems, is not good. During our interviews in Technical Functions, we were informed that drawings were not revised until five design change notices

(DCN's) had been completed. Then, the drawing would be revised, showing all five of these DCN's. Since the interval from the first DCN to the fifth DCN could be protracted, some drawings are not current as regards modifications.

RECOMMENDATION

Revise drawings when DCN's are received in Design and Drafting such that no DCN will be more than six months old.

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T/F ENGINEERING SERVICES
Design and Drafting

FINDING VI-B-4

Rework, as measured by the number of Field Change Notices, is excessive.

DISCUSSION

Ideally, there would be no need for a Field Change Notice, however the need will always exist. Some Field Change Notices should never have been written—the one requesting correction of a misspelled word, for example. But others are real. All are difficult to cope with and increase the cost of doing work. The number of Field Change Notices, and hence the amount of rework required, will decrease only to the extent the accuracy of the original drawing is improved. Others have solved this problem by design reviews with consideration for constructability, ALARA, operation, maintenance, and accessibility. This should not require a large review board to accomplish, rather plant checks for existing conditions and supervisory review should suffice.

RECOMMENDATION

Technical Functions, involving Plant Engineering as appropriate, should conduct design reviews before work is started to decrease the need for Field Change Notices during construction, operation, or maintenance.

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T/F LICENSING & REG AFFAIRS
Staffing

FINDING VI-C

There are too many people assigned to the Director, Licensing & Regulatory Affairs.

DISCUSSION

There are 38 people in this group. There are 14 assigned to PWR licensing, 7 of whom are at the TMI site, and there are 11 assigned to BWR

licensing, 4 of whom are assigned to the Oyster Creek site. Seven are in Environmental Licensing and 4 are in Generic & Regulatory Affairs. There is justification for GPUN to carry a larger number of Licensing people than other nuclear units, particularly during the past several years while hearings were going on relative to TMI-1 restart. However, when the TMI-1 restart issue is resolved, the total number of people in this group should be reduced. The BETA review indicates that the size of this group is justified on the basis that it performs engineering functions which should be done by Engineering and Design or Systems Analysis. Licensing and Regulatory Affairs (L&RA), to be most effective, should be in a position to provide a knowledgeable interface between GPUN and the regulatory bodies. It should avoid functioning in the extremes, where on one hand they are merely a paper-passing mail drop, and on the other hand being in a position where they make technical decisions. They should provide a technical input into the decision making process based on their unique knowledge of the regulatory process.

BETA also questions the necessity to have a separate group of 3 people assigned specifically to Generic & Licensing Affairs. That function could be performed by one person in the headquarters organization. It is also BETA's opinion that seven people, including those located at the sites (3), are too many to handle Environmental Licensing.

RECOMMENDATION

The role of L&RA should be redefined to ensure it acts as the knowledgeable interface between GPUN and the regulatory bodies. It should be possible to effect a reduction in the number of people assigned to Licensing and Regulatory Affairs. After the TMI-1 restart, a further reduction should be possible without sacrificing the performance of any necessary function normally expected of this group.

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T/F ENGINEERING AND DESIGN

FINDING VI-D

There is a lack of intimate, day-to-day knowledge of the problems being found at the plants that require engineering support or involvement.

DISCUSSION

One essential element in creating an effective engineering group that takes a leading role in improving the operation of the plant is knowledge of what is happening at the plant. Our review indicates that this is lacking at Oyster Creek and TMI-1. There still exists too much of the attitude that if Technical Functions support is needed, the plant will ask for it. We could not detect a sense of "ownership" or inquisitiveness. There have been efforts made to improve this situation but the results so far are meager. It takes time and effort to develop a headquarters engineering group that has the confidence in itself and has developed the confidence of the site people. The people in Engineering and Design need to have a better means of keeping informed on what problems exist at the sites without creating a burden on

the plants. Each site has a Technical Functions representative and it may be appropriate to make more use of him as a source.

RECOMMENDATION

The Engineering and Design Director should investigate means for having plant information and problems flow into his organization on a routine basis and not just when Technical Functions support is called for. He should also instill into his people the feeling that they are more than just a service waiting to be tasked.

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T/F SYSTEMS ENGINEERING
STAs

FINDING VI-E-1

The Shift Technical Advisor (STA) program at both sites, but particularly at Oyster Creek, needs to be reviewed and strengthened.

DISCUSSION

There are a number of problems associated with the STA program at both sites. These problems are known by GPUN management and action is being taken to correct them. These problems involve attrition, the STA training program, and proper utilization of the STAs, both in their training period, and in their status as qualified STAs.

There are a number of observations which BETA believes should be considered in GPUN's effort to improve the STAs.

It appears that the STA training program is too operator oriented. The purpose of an STA is to provide the Shift Supervisor on watch a higher degree of technical expertise during a plant crisis than normally resides with the Shift Supervisor. While the STAs need to understand how the plant operates, they are not there to act as a "super" shift supervisor. Their training should be oriented towards developing a high degree of technical knowledge of the plant, understanding why things happen the way they do, and developing the ability to anticipate phenomena at a technical level higher than normally expected of a Shift Supervisor. Our observation is that this is not being done. One contributing factor could be the practice of actually attempting to qualify STAs as SROs.

There is a serious lack of understanding on the part of the Shift Supervisors at both plants on the role of the STA. To some extent, there is an element of distrust of the STAs' ability and of their motives. There is also a lack of understanding on the part of the STAs as to just what role they are to play, particularly during the vast majority of time that the plant is not in an abnormal mode.

RECOMMENDATION

a. In the process of developing the STA training program, which is now underway, greater emphasis should be placed on providing the trainee with a firm technical foundation and less on making him a qualified operator.

b. Consider changing the practice that STA's obtain an SRO license. There may be certain factors that would lead GPUN to conclude that this practice be continued. However, all factors should be considered. STA's should be SRO trained and should be required to pass all requirements except the NRC examination. Incentive bonuses could still be awarded for this accomplishment.

c. Make sure there are sufficient STAs in the training program to handle, not only expected attrition, but to ensure that promised rotation out of the STA role will take place.

d. Review the ground rules on just what an STA is expected to do during abnormal situations, and, just as important, what he is expected to do during normal day-to-day operations. After reviewing these ground rules, make sure the Shift Supervisors understand them.

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T/F SYSTEMS ENGINEERING
Systems Analysis Director

FINDING VI-E-2

The need for a Systems Analysis Director is questionable.

DISCUSSION

There exists within Systems Engineering a group entitled Systems Analysis. It has two groups; Safety Analysis and Plant Control, and Plant Analysis. The former group, consisting of ten engineers, is basically responsible for developing and using the software to analyze plant safety. The latter group performs trend analysis and is responsible for the STAs.

Each of these groups is headed by a Manager. The Systems Analysis Director also handles Human Factors engineering. It is the opinion of BETA that the existence of the position of Systems Analysis Director is unnecessary and can be eliminated. All of the functions now performed can be performed within the two groups.

RECOMMENDATION

BETA understands that action has been taken on this item.

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T/F SYSTEMS ENGINEERING
Involvement in Training

FINDING VI-E-3

There is lack of involvement by Technical Functions in the conduct of the Training Program, particularly operator training.

DISCUSSION

Consistent with the creation of the functional GPUN organization is the concept of greater involvement in all technical areas by Technical Functions. Because of the many problems being found in the training programs at TMI-1 and Oyster Creek, BETA assumed that there would be noticeable evidence of Technical Functions involvement with the corrective effort. BETA could detect very little, and it is not clear that there is at this time much interest in having any, either on the part of Technical Functions, the plants, or the Training Division. BETA considers this to be a mistake, particularly with respect to operator training. BETA recognizes that at its present state of development with its limited capability, T/F is hard-pressed to move into this area at this time. However, there should be ways T/F can become more involved in training than it is today.

RECOMMENDATION

Technical Functions should consider ways to take a more active interest in providing technical guidance to the training programs, especially operator training.

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T/F SYSTEMS ENGINEERING
Nuclear Design Capability

FINDING VI-E-4

GPUN's goal to achieve an in-house licensed nuclear design capability may not provide the anticipated advantages.

DISCUSSION

During the review of the Technical Functions Division, Nuclear Analysis and Fuels group, it was apparent that GPUN management was aware of and concurred in a projected change in direction in the group's operation. The long term objective is to provide an in-house capability to perform nuclear calculations to support issues relating to licensed matters.

Three advantages are given for providing this capability. The first was to reduce GPUN's dependence on core vendors, the second was that a better job would be done by GPUN, and the third was that it would save money. Other secondary advantages, such as flexibility, also would result from this approach.

Based upon BETA's review, it is concluded that the proposed design capability upgrading would not provide GPUN with a complete independence from core vendors. The nuclear design calculations to be performed by GPUN would depend upon information and calculations performed by the vendors who also must obtain NRC approval of their work. GPUN's design calculations would depend upon the use of:

1. Standard fuel assemblies or bundles available from the vendors.

2. The results of vendor analyses which specify the range of acceptable fuel performance parameters for these standard fuel assemblies or bundles.

In addition to the above dependence on the core vendors, GPUN would also depend on the core vendors or other outside suppliers to perform certain licensing calculations to support the GPUN nuclear design group. An example is loss of coolant calculations. These licensing calculations, which are performed infrequently, would be performed by consultants or the core vendors.

As can be seen from the above, developing the planned in-house analytical capability will not provide a complete independence from the core vendor or outside consultants.

At the present time, with its existing manpower in the Oyster Creek group, Nuclear Analysis performs calculations to assure that the core vendors provide optimum reload configurations. This in-house optimization capability currently assures that BWR core reloads are indeed optimized. There is no reason to believe that converting to a licensed analysis would provide a more optimum core configuration than is currently obtained.

To achieve an in-house licensed nuclear capability is difficult. While a few utilities have efforts underway to obtain such NRC authorization, as of mid-1982, only one was close to achieving this objective. It would appear that a nuclear engineering manpower level of approximately fifteen engineers for each plant would be required to develop this capability and meet the day-by-day plant support requirements. This represents a net manpower increase of about five engineers per year per plant type to achieve this objective. Several years' (three or four) effort would be required.

The other stated advantage for developing an in-house licensed nuclear design capability is cost savings. It is understood that core vendors currently charge approximately $1.2 - $1.7 million for a licensed major core configuration design. Routine reload calculations cost approximately $500,000, while minor design modifications cost approximately $200,000. Present GPU in-house capability for Oyster Creek is able to calculate routine reloads and minor design modifications. It is understood that these calculations currently satisfy NRC requirements for showing that minor loading changes meet license requirements. Based upon the estimated costs for service by core vendors and consultants and the GPU estimated manpower requirements to develop and maintain an in-house licensed capability, it appears the cost to provide this in-house capability would be offset by the savings that would result (this is a breakeven situation).

In summary, the advantages resulting from the proposed GPUN action are not substantial. In addition, there is a significant potential disadvantage that has not been addressed. In most cases the techniques that will be used by GPUN are those that are being developed by EPRI. GPUN does not plan to have an in-house method development capability. As long as core operations do not result in the discovery of new phenomenon, the EPRI model should be satisfactory.

It is anticipated that new phenomenon will not occur if GPUN continues to use the current class of fuel assemblies which have been thoroughly proven in operation. However, if GPUN anticipates they will want to use "state of the art" fuel assemblies, they should recognize that operational experience may raise issues. This would require use of performance models which are not included in the EPRI catalogue. GPUN will be dependent on the designer for technical support. By GPUN actions to obtain independence they will find it difficult to obtain this support when required.

RECOMMENDATION

Unless GPUN is willing to restrict its fuel selections to proven technology and not attempt to incorporate advantages in performance until they have been thoroughly tested in operation at other plants, BETA believes that there is no reason to develop an in-house licensed nuclear design capability. If such a capability is not developed, a nuclear analysis staff of nine engineers per reactor type should be adequate to handle GPUN's analytical fuel requirements.

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T/F ENGINEERING PROJECTS
Task Assignments

FINDING VI-F-1

Engineering Projects personnel are performing tasks that could be better done elsewhere in the Division, thus decreasing their capacity for the management of engineering projects.

DISCUSSION

Project engineers in the Oyster Creek Engineering Project are spending time making material lists from drawings in preparation for requisitioning material. This is a distraction from their primary function. The material lists could be prepared more readily in the drafting room under the supervision of the Manager, Design and Drafting. Requisitioning could be more effectively done either by Design and Drafting or Engineering and Design. These latter organizations traditionally perform these functions in most companies. The advantage would be that the Project Engineer would be freed from these chores and could devote his time to the project management aspect of his work, which urgently needs greater attention. The above are just two examples of the Oyster Creek Engineering Project engineers doing the work that should be done in Design and Drafting or Engineering and Design. We conclude that this is a holdover from the previous JCP&L Oyster Creek Generation Engineering practice, which in that environment, was

entirely proper and required. However, the previous Generation Engineering group is now an Engineering Project group. About one-half of the Oyster Creek projects are still in the old Generation Engineering style.

A multitude of tasks are being left undone in the Oyster Creek Engineering Project, although the group is quite large relative to the TMI-Engineering Project:

a. Too many jobs exceed budget and too many fail to meet schedule. These phenomena usually come as a surprise and can be avoided by closer tracking and guiding of costs and work in progress.

b. Approximately 20% of the total GPUN budget is spent on Technical Functions originated contracts for engineering. That work, as well as the in-house work in Engineering and Design should be tracked closely by the Engineering Project to ensure costs are worthy and performance is satisfactory.

c. If a project engineer spent more time managing the cost, schedules, and performance of an engineering task, he would not have to devote the large amount of time now devoted to justifying or accounting for cost overruns and schedule delays.

d. A modification to the plant is developed technically in Engineering and Design and the modification is taken up by Engineering Projects. Base line engineering is, on occasion, performed in Engineering Projects. It is our opinion that base line engineering would be performed better and more logically in Engineering and Design under technical supervision. This, again, would free up project engineer time for project management.

RECOMMENDATION

The functions currently being performed in the Engineering Project that detract from the project management capability of a project engineer should be evaluated and reassigned to strengthen the effectiveness of Engineering Projects.

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T/F ENGINEERING PROJECTS
Training of Engineers

FINDING VI-F-2

The training of project engineers is weak.

DISCUSSION

Project engineers are not given training on how the Company is structured or how it is supposed to work. There are too many who do not understand the organization. They fall in the category of "new to the Company" or "still living in the old days".

Because of the impact that a project engineer can have on the proper control and management of a project, specific training in the Company's methods and policies is essential.

RECOMMENDATION

Provide training to Project Engineers in the Company's structure, methods and policies.

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T/F ENGINEERING PROJECTS
Cost Information

FINDING VI-F-3

Project engineers do not receive adequate information concerning the progress, cost, and trends in progress and cost for the budget activities for which they were the originating source of authority for the modification or the major O&M project.

DISCUSSION

A project engineer is the person at headquarters who is responsible for the budget activities assigned to him. He, with assistance, of course, developed the initial budget and schedule and initiated the requisitions for contracted engineering services, long-lead material, and the work authorization to M&C. Having converted the job from an engineering concept to a cost incurring project, he must have feed-back on costs and progress of the work—not only to manage the project in Technical Functions, but also to prepare himself for more effective work on subsequent jobs. The current reports are not adequate for the need.

RECOMMENDATION

Engineering Projects, Engineering Services, M&C, the plants, and Information Services should devise the reports that will permit having a running knowledge of cost and performance. To offset the cost of this work, this same group could easily determine a number of current reports which could be eliminated.

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T/F STARTUP AND TEST

FINDING VI-G

A separate group at the Director level for Startup and Test is questionable.

DISCUSSION

There is no question that there need to be people who are assigned the responsibility for startup and test. BETA questions the need for creating

a separate group at the Director level and having 23 people assigned. At the site these needs can be filled by assignments within Plant Engineering. At headquarters they can be filled by assignments in System Engineering. There should not be a need to have 23 people assigned full-time to this area.

RECOMMENDATION

Consider reassigning this group at headquarters into the System Engineering group. Assign the site people to Plant Engineering and reduce the overall number of full-time people. As needs dictate, each of these groups can be augmented by engineers at the locations needed.

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T/F CHEMISTRY

FINDING VI-H

Neither the chemistry group in Technical Functions nor the System Laboratory has assumed a leadership role in the TMI-1 or Oyster Creek chemistry improvement programs.

DISCUSSION

Until recently, Oyster Creek and TMI-1 have lacked competent management of their chemistry programs. Although the chemistry deficiencies had been reasonably well identified, the plants did not recognize how to solve their key problems. Talented chemistry personnel capable of helping the plants solve their chemistry problems, including the management ones, have been available under Technical Functions Chemical Engineering and in the System Laboratory located at Reading, Pennsylvania. Although this Laboratory was not transferred to Technical Functions until April 1982, it was available under Nuclear Assurance previously.

Strong feelings were apparent against the other chemistry groups among senior personnel at System Laboratory, Chemical Engineering, and the nuclear plants. Signs of jealousies, finger-pointing, turf battles, and expressions of "that is not my job" have been all too evident. Although Chemical Engineering and System Laboratory personnel feel they have provided great assistance to TMI-1, they have not provided what has been needed to solve the major chemistry problems at TMI-1 and Oyster Creek in a reasonable time. A chemist has recently been hired from outside GPU as director over Chemical Engineering and System Laboratory. One of his first priorities is to resolve the conflicts between these groups and between these groups and the plants.

RECOMMENDATION

Resolution of the conflicts among the chemistry groups could be simplified by removing System Laboratory from GPUN. This would have the advantage of removing about thirty manyears per year of nonnuclear work from GPUN since about 90 per cent of the work of System Laboratory is for fossil plants. Because this reorganization would make it harder in the short term to use the resources of System Laboratory, this change should

be viewed as a long term objective after the chemistry programs at TMI-1 and Oyster Creek have been improved.

The new T/F Chemistry Director has been directed to get actively involved in all areas required to obtain the needed improvements in TMI-1 and Oyster Creek chemistry programs. BETA considers this broadening of assignments to T/F chemistry personnel should help resolve the previous problems.

CHAPTER VII

ADMINISTRATION FINDINGS AND RECOMMENDATIONS

CHAPTER VII. ADMINISTRATION FINDINGS AND RECOMMENDATIONS

GENERAL

When GPUN was formed it was clear that there would have to be certain divisions such as the plants, technical functions, etc. It was also known that there would have to be a division to handle the administrative load of the corporation. What happened was that the Administration Division became the recipient of any function which did not clearly belong in one of the other divisions. This is why there ended up being so many diverse activities located within Administration. The fact that it "controlled" the money and the people immediately put this Division into a position of perceived power. It was soon evident that it, as a Division, would have more GPUN people on the payroll than any other division. These conditions lead to problems.

During the past year, BETA has been able to observe a needed retrenchment in the breadth and scope of functions coming under Administration. BETA has also recently seen a start in the reshaping of the role Administration plays in carrying out corporate policy in contrast to the role it appeared to be taking in the early phase of its development. These are healthy signs. The specific comments which follow further expand on this theme.

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ADMIN EFFECTIVENESS

FINDING VII-A

The Administration Division needs to improve its ability to provide a service function and to lessen the perception that it is a control function.

DISCUSSION

It is BETA's opinion that the Administration Division, with the number of functions it now performs, has become overly oriented towards attempting to control events rather than providing a service. This opinion is shared universally throughout GPUN. There is, and has been, an effort to correct this situation within the Division. However, BETA feels that some fundamental changes are necessary before this problem will be resolved.

The original composition of the Administration Division included handling essentially the following functions:

a. Fiscal Management
b. Material Management
c. Facilities Management
d. Contract Management
e. Security
f. Human Resources
g. Information Management
h. Other

The Division was not organized strictly along these lines, but they were the major areas covered. They all provided a service of one kind or another to other divisions. Because of the nature of these services, they needed to be consistent across the divisions and, in some cases, such as in Fiscal Management, they needed to act as control functions in the name of the Office of the President. Policy is established by the Office of the President and in many cases it is then the job of Administration to determine if it is being carried out. It should do this in a mode of cooperation and assistance to the other divisions rather than in the role of an adversary. It should be the goal of Administration to develop procedures and methods for carrying out corporate policy in such a way that it causes the least amount of disruption within the other divisions and without creating the impression that these functions are an end unto themselves.

For example, it is certainly corporate policy that costs will be controlled. There are certain requirements imposed on GPUN by the GPU Service Corporation and others on just how this is to be done. However, even within these constraints, Administration still has the freedom to create a system within GPUN for controlling costs. In doing so, Administration can take the approach that it will develop a system that accomplishes the desired end but is so complex and onerous that the divisions either can't comprehend it or haven't the time or people to carry it out. On the other hand Administration can approach the problem by, first, understanding the problems and capabilities of the other divisions and, then, seeing if they can develop a system that is effective but not overpowering.

It is BETA's opinion that, at least for the first year or so Administration took the first approach. It created the impression that it was all-powerful and imposed its will as it saw fit in the name of the Office of the President. A number of actions since then have eased this situation. For example, in October 1982, the Human Resources Department was transferred from Administration to the Office of the President with the Director, Human Resources reporting directly to the Executive Vice President.

RECOMMENDATION

a. The Director, Administration and his leading people should continue to redirect their efforts with the aim of providing an effective service to the other divisions. This can be enhanced by Administration doing those things that the divisions can not do and by letting the divisions do what they are structured to do best.

b. The Administration Division should attempt to change the impression that they and they alone determine how corporate policy is to be carried out in administrative matters.

c. Adopt the motto, "We Serve the Plants".

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ADMIN MANAGEMENT SERVICES

FINDING VII-B

The Manager of Management Services has a narrow scope of work assigned.

DISCUSSION

At the time of our review the Manager of Management Services was responsible for the Policy and Procedures system and the Limit of Signature Authority procedure. He was also preparing a supervisor training course. Since the time of our interview, the Manager of Management Services at TMI-2 and the two people working for him have been assigned to the Manager of Management Services. BETA notes that GPUN has undertaken to concentrate the support functions for TMI-2 in the TMI-2 site organization and considers it would be logical to assign the TMI-2 Management Services section to the Director, TMI-2, rather than have a Parsippany manager responsible for three people at TMI-2 who are working exclusively in support of that site.

Since the procedures mentioned above have been issued and implemented in GPUN, BETA considers the scope of work does not justify the position "Manager of", nor the staff assigned.

RECOMMENDATION

Consider increasing the scope of work assigned to this senior manager or deleting the position.

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ADMIN OPERATIONS ANALYSIS

FINDING VII-C

The efforts of the Operations Analysis (Ops Analysis) group within Administration are not effectively channeled.

DISCUSSION

Having an Ops Analysis group within GPUN can provide the Office of the President with useful information that might not be readily available elsewhere. However, based on the review conducted by BETA, it does not appear that very meaningful or even useful areas have been reviewed. It is also our opinion that this situation will not be improved if the Ops Analysis group is asked to come up with the items to be reviewed or to set the priority. Under normal circumstances, each manager should do his own operations analysis, and, if he is capable and honest about it, the most expert answer will emerge. If Ops Analysis is used in an "investigative" mode, then QA is usually the place to turn. Where an Ops Analysis group

can be used, and it should be used only by the Office of the President, is to look into areas that don't fall in either of the two previously described.

Based on BETA's review, the present Ops Analysis section is not being used properly. In fact, it is BETA's understanding that during the recent past, this group has been used to implant a cost control system within GPUN, a role completely outside the accepted function of such a group.

RECOMMENDATION

The efforts of the Ops Analysis group within Administration should be directed by the Office of the President.

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ADMIN MATERIALS MANAGEMENT
Contracts

FINDING VII-D

The cost reductions possible with more sophisticated contracting methods are not being achieved.

DISCUSSION

Our early experience and exposure to contracting at GPUN created an initial feeling of concern. Essentially all work was on a time and material basis, and insignificant effort on the part of the requisitioner was devoted to managing the contracted work. Comments on the role of the requisitioner are in Finding VI-F-1.

The current assessment of Contracts Management was done late in our review period, and we found much has been done in Contracts Management to correct the early problems. Contracts Management now works closely with requisitioners and provides assistance, advice, training, and support in developing requisitions that can be converted to the best type of contract.

Contracts Management has recently instituted a series of seminars for requisitioners, working with small groups, and plans to reach all prospective requisitioners. The seminars are to explain GPUN contracting policy.

RECOMMENDATION

a. Continue training of requisitioners. Also, devise a scheme for measuring the success of this training, e.g., how many requisitions must be returned for lack of compliance with instructed methods.

b. Place greater emphasis on using Cost Plus Incentive Fee type contracts. This will require having better scope of work definitions.

c. Consider establishing monthly progress reports from major contractors in which work progress identified by task, and actual costs to the contract, by task, are reported. Also consider

establishing quarterly reports from major contractors in which they forecast work progress and anticipated expenditures.

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ADMIN SECURITY

FINDING VII-E

There needs to be overall improvement in the Security Division in order to improve its efficiency.

DISCUSSION

In the security area, BETA contracted with an outside firm, Theodore Barry and Associates (TB&A), at the request of GPUN to assist BETA in its review. Two representatives of TB&A conducted a review at the two reactor sites and at headquarters. In addition, BETA independently reviewed a number of areas in the security area. These reviews indicate that while there are no serious problems which would contribute to high costs or poor efficiency, there are a number of findings which indicate that security management is not aggressively pursuing an across-the-board effort to improve its operation. The BETA findings which follow are examples of these indicators and are derived from the TB&A review as well as the BETA review. TB&A has prepared a detailed report of its findings and recommendations, a copy of which has been transmitted to GPUN management.

RECOMMENDATION

Refer to specific Findings that follow.

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ADMIN SECURITY
Administration

FINDING VII-E-1

Some security administrative functions at TMI-1 and -2 can be combined to save manpower.

DISCUSSION

Currently the security forces at TMI-1 and -2 work jointly and share responsibilities in several areas. For example, Unit 1 operates the site security computer system for both Unit 1 and Unit 2.

At this time, both TMI-1 and -2 have access control clerks and clerk typists. The TMI-1 access control is computerized while the TMI-2 operations are manual. The TMI-1 supervisor stated that the TMI-2 access control workload could be handled by the TMI-1 clerk.

RECOMMENDATION

It is recommended that the TMI-1 access control clerk handle the TMI-2 workload. Changes to the administrative procedures can be made to accommodate this change and a savings of one clerk at a cost of approximately $20,000 per year. In addition, TMI-1's clerk typist should be used to support TMI-2 at a savings of an additional clerk. BETA has determined that such a joint effort is consistent with current practice at TMI, is not contrary to the separation of facility requirements in effect at the site, and would not constitute a mode of direct access between Unit 2 and Unit 1.

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ADMIN SECURITY
TMI Response Force

FINDING VII-E-2

The Response Force capability at TMI-1 and TMI-2 can be considered to be 10 armed guards (each plant will support the other). Because outside support is readily available, a smaller Response Force would meet NRC requirements.

DISCUSSION

In several areas the security forces at TMI-1 and TMI-2 work jointly and share responsibility. For example, TMI-1 operates the site security computer system for both units. Also the entrance gate security responsibility is shared. This shared responsibility is accepted by NRC. In the event of an armed attack, both the TMI-1 and TMI-2 staff indicate they will go to the aid of the other group. The response force capability is 5 guards at each plant. NRC requires a site response force of from 5 to 10 guards, depending on the availability of outside help. In the case of the TMI site, because of the offsite response capability, it is judged that NRC would consider acceptable a response force of less than 10 guards, for example, 6 to 8 guards. It is recognized that a reduction of response force requirements will not necessarily mean a one-for-one reduction in guard force manpower, however, TMI-1's security supervisor indicated that at least one guard position could be eliminated if the response force requirements were reduced.

RECOMMENDATION

GPUN should consider the combined response force capability at TMI in meeting NRC requirements. A reduced total capability of 6 to 8 guards should be negotiated with NRC. Where possible, the guard force should be reduced reflecting the above change. For each guard position canceled, 4.5 man-years of guard cost will be saved. BETA has determined in discussions with NRC and GPUN staff, that the proposed combined TMI effort is consistent with other TMI joint security efforts and is not contrary to the NRC requirements regarding separation of TMI-1 and TMI-2 facilities. In addition, this type of potential direct access between Unit 2 and Unit 1 (emergency related) was specifically identified in GPU's statement regarding limited direct access of Unit 2 to Unit 1.

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ADMIN SECURITY
TMI Engineering Support

FINDING VII-E-3

Inadequate engineering and construction support for the TMI-1 and TMI-2 security operations is resulting in the need to substitute guards for security hardware. Such substitutions are expensive.

DISCUSSION

The review disclosed, that because of minor engineering or construction scheduling problems, guards were being used in place of installed (or to be installed) secuity hardware at TMI. Examples include:

a. The use of a guard, 4 shifts, seven days a week, to observe the locked unalarmed gate separating the TMI-1 and -2 sections of the fuel handling bays (doors 73 and 74 in the environmental barrier). The barrier has been installed for over thirteen months, however, the electrical work was not completed and the door alarms have not been activated. Guards used in place of the alarms have cost over $100,000 during the past thirteen months. At the time of this review, the installed door alarms were yet to be connected. Construction scheduling was identified as the cause for this delay.

b. Doors 11 and 16 at TMI-2 have used guards to control access since the accident in 1979. This has cost in excess of $100,000 per year. Prompt installation of properly monitored door alarms would have saved this expense. Once door alarms were installed, the alarms were not used due to a simple problem associated with the alarm display. During the period of this review this problem was resolved and the guards are no longer used at this location.

RECOMMENDATION

a. Adequate engineering and construction support should be supplied for security operations. Priorities should address the large costs associated with supplying manual backup to the security hardware.

b. Procedures should be developed to require a periodic review of those cases where minor degradations in security system performance are compensated for stationing guards to assure that, in some cumulative manner, these do not result in GPUN's not meeting its commitments to NRC.

c. The alarms at fuel handling bay doors 73 and 74 should be activated and the manpower allocated to the TMI-1 guard force should be reduced by 4.5 manyears.

d. The manpower allocated to the TMI-2 guard force should be reduced by 4.5 manyears to reflect the activation of the alarms at doors 11 and 16.

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ADMIN SECURITY
TMI-2 Protected Area

FINDING VII-E-4

The TMI-2 entrance to the protected area uses a temporary building and manual search to control entry of personnel. This facility and its operation is inefficient in the use of guard manpower.

DISCUSSION

During this review it was noted that the protected area entrance at TMI-2 had a larger number of guards than TMI-1. This is a result of the lack of metal detectors, hence, the requirement for manual search and of the small and inefficiently laid out building. TMI-1's processing center operates with a significantly smaller staff.

RECOMMENDATION

If funds can be made available, the TMI-2 processing center should be upgraded. Temporary structures can be used but sufficient space should be provided to allow efficient operation. In addition, metal monitors and explosive monitors should be provided. It is estimated that the annual savings in guard salary will eventually offset the cost to upgrade the facility.

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ADMIN SECURITY
TMI Alarm System

FINDING VII-E-5

The protected area perimeter alarm system at TMI has an excessive number of alarms.

DISCUSSION

During this review it was noted that the perimeter alarm system at TMI has an excessive number of alarms. This is a result of false alarms and, in addition, results from the passage of workers and guards through the monitored areas. It is anticipated that this level of performance will not meet future NRC requirements. It is understood that GPUN is evaluating and upgrading the alarm system.

RECOMMENDATION

The perimeter alarm system should be upgraded to produce a system with a minimum number of false alarms.

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ADMIN SECURITY
Manpower

FINDING VII-E-6

Manpower requirements fluctuate as a result of training requirements, special security assignments and multi-shift operations. Extensive overtime is required to support this fluctuating workload.

DISCUSSION

There may be cost reduction potential in changing tour durations and reconfiguring shifts. Due to the high number of craft workers at all sites, there is a peak security manpower need during shift changes. It may be possible to provide security shift configurations which cover these peak periods while not retaining excess manpower beyond the actual need. For example, revolving four 10-hour days could be used to provide a two-hour overlap in the morning and evening to facilitate ingress and egress processing of high numbers of outage craft.

RECOMMENDATION

Review the current structure to determine when additional staff are needed to handle peak security requirements. Examine alternative shift scenarios and tour configurations in an effort to reduce the overall manpower requirement and use of overtime.

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ADMIN SECURITY
Unnecessary Guard Protection

FINDING VII-E-7

Guard protection is being provided to areas that may not require the protection or warrant the expense.

DISCUSSION

The following examples may indicate that the cost effectiveness of current guard coverage has not been assessed:

o Evening guard protection is provided for the TMI Training/Visitors Center. Coverage could be accomplished by installing a local security alarm (or using a leased line to the Central Alarm Station) and utilizing random patrols.

o Guard coverage is provided at Forked River. If possible, valuable materials that could be subject to pilferage should be liquidated or stored at other facilities.

o The TMI south gate needs to be covered by security guards only during the peak shift-change hours. Currently, the south gate serves predominately TMI-2 contractors. At the current craft manpower levels, the south gate access point could be closed except for peak ingress and egress times (approximately 0600-0800 and 1430-1630). The north gate can accommodate the additional trafffic from the south gate at nonpeak hours.

RECOMMENDATION

The above security considerations should be evaluated for cost effectiveness. It is estimated that these changes would save 8.5 to 9 manyears of effort.

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ADMIN SECURITY
Contractor Support

FINDING VII-E-8

GPUN has not received adequate support from Vikonics in correcting keycard access system deficiencies.

DISCUSSION

The card access system has been plagued by hardware and software problems for several years. Vikonics, the turnkey supplier of hardware, software and installation, has failed to provide adequate support towards correcting system deficiencies. The problem has been exacerbated by the fact that GPUN has not dedicated someone with a strong computer background specifically to support the system and to act as a liaison with Vikonics. GPUN has recently threatened citing nonperformance and withholding the performance bond retained against Vikonics in an effort to force Vikonics to correct deficiencies.

RECOMMENDATION

GPUN should consider having an engineering evaluation made (either by GPUN, GPUSC, or contractor personnel) of this problem. This engineer should evaluate the proposed Vikonics' corrective action. This evaluation should include inputs from the other utilities using Vikonics' equipment. This evaluation should consider the effectiveness of the system as is, and the likelihood Vikonics will correct the existing deficiencies. Based upon this review a plan of action should be identified which includes both engineering and legal alternatives.

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ADMIN SECURITY
Position of Lieutenant

FINDING VII-E-9

Approval has been requested to reorganize the security force to establish a Lieutenant position at each site.

DISCUSSION

It is understood that in order to provide additional administrative support and advancement opportunities, action is underway to establish a Lieutenant position at each site.

RECOMMENDATION

If it is decided to provide this new position, the total number of managers in Security should not be increased.

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ADMIN SECURITY
Overtime

FINDING VII-E-10

The security operations require extensive overtime.

DISCUSSION

Current security operations at the three sites require the use of approximately 18 man-years of overtime. Considering the premium costs associated with this overtime, it represents a significant fraction of the cost of guards and should be included in establishing manpower levels.

For example, the current onboard staffing of the Security Department at Oyster Creek is 62. However, the current overtime usage raises this number to the equivalent of 72 man-years. The end of year 1982 authorized level is 54. It appears that this number does not reflect the use of overtime and, unless it is controlled, the possibility exists that overtime will be increased to offset the reduction of personnel. For TMI-1 the onboard staffing is 54, with overtime, the staffing is the equivalent of 57.5 man-years. The end of year 1982 authorized level is 50. Again, it would appear that this number does not reflect the use of overtime.

RECOMMENDATION

- Manpower assessments in the security area should include consideration of the overtime usage.

- Based on comments in this and other findings in this section, the recommended staffing levels, including the use of overtime, are as follows:

	Manyears Effort
Oyster Creek	62.0
TMI-1	48.5

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ADMIN SAFETY AND HEALTH
Need for Doctor

FINDING VII-F

GPUN has no employee who is a medical doctor at headquarters or TMI-1 or Oyster Creek to oversee medical aspects of the GPUN radiological health program. Part time contract physicians and a contractor are used for these functions.

DISCUSSION

In addition to conducting physical examinations, physicians are needed for several radiological health functions, including treating injuries involving radiation or radioactivity, advising workers and the company on radiation workers who have unusual conditions, assisting in radiation injury claims, and ensuring medical records will support future needs regarding radiation injury claims. Part-time contract physicians have been conducting physical examinations at TMI-1 and Oyster Creek but they have not been trained for these other functions. There have been examples where these other functions have not been performed well. These other functions require a degree of expertise and sensitivity and training that is unlikely to be obtained in part-time contract personnel.

BETA considers a company physician to be an important part of a radiation claims prevention program. The value of such a person has been demonstrated in past BETA experience to outweigh the difficulties in obtaining, training, and retaining a physician interested in occupational medicine. The position does not call for a nationally recognized radiation medicine expert; such people are available as consultants when needed and the limited work requiring such an expert at GPUN would not keep him challenged as a full-time employee. In past BETA experience the benefits to the radiation claims prevention program have been achieved by obtaining a physician trained in occupational medicine and providing him extra training in radiation. Ensuring close ties with the radiological control organization has also been essential.

The need for a GPUN employee to perform this work is particularly important for TMI Unit Two because of the increased amounts of radioactivity and radiation and the unusual nature of the work compared to other licensed power reactors. The potential for radiation injury claims is greater at Three Mile Island than elsewhere.

Salaries are high for occupational medicine physicians and they are hard to find. However, some of the also high costs of contract physicians could be saved. Overall, costs would probably not decrease, but they should not increase much if one company physician were hired. There is a large potential cost saving in radiation injury claims that is much greater than the salary of such an employee.

It is possible to obtain most of the benefits of having a physician employed by GPUN without having one for each nuclear plant. The physician

could be located at Three Mile Island and spend about one day per week at Oyster Creek.

RECOMMENDATION

GPUN should consider employing a physician at Three Mile Island and assigning him medical radiological health responsibilities for TMI-1, TMI-2, and Oyster Creek.

CHAPTER VIII

HUMAN RESOURCES FINDINGS AND RECOMMENDATIONS

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HUMAN RESOURCES
Completing Personnel Actions

FINDING VIII-1

There is a need to reduce the time it takes to complete a personnel action.

DISCUSSION

For a number of reasons some personnel actions take too long to be completed. Without arguing the merits of any given case, examples of personnel actions involving hiring, termination, pay status, benefits, transfers, etc., were noted to take months to complete. Reasons ranged from their being too many approvals/concurrences required, to too much paper work required, to the need for "committee" action, to just having a paper sit on someone's desk for several weeks awaiting action. Not only does this create a bad impression of Human Resources, but, more importantly, it has resulted in the feeling down within the organization, that top management is insensitive to the gut issues that affect an individual's personal well-being.

BETA was informed by a number of people that contributing to the inability to move quickly on personnel matters is the existence of a number of high-level corporate committees, such as the Presidents' Committee and the Personnel Practices Committee, that seem to get involved in too many issues that should be handled routinely. If this is true, it is another example where decision-making within GPUN has been elevated to the point that it takes inordinate time to get a decision, and just as important, people at the lower levels automatically push the decision upward to avoid future reversal.

RECOMMENDATION

All levels of management need to understand better the need to take quick action on any matter affecting personnel—either good or bad. Human Resources needs to bring to the attention of management any instances where there is a needless delay in taking a given personnel action. This means Human Resources needs to be able to keep track of the status of pending personnel actions.

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HUMAN RESOURCES
Position Titles vs Salary

FINDING VIII-2

The number of GPUN personnel who have the title of "Manager" or above, is high in comparison to the total number of GPUN employees.

DISCUSSION

There are four levels of management who have titles of "Managers" or above. These positions include:

1. Director of ___
2. ___ Director
3. Manager of ___
4. ___ Manager

Within the GPUN organization of 2589 employees, there are 244 who are "Managers" or above. This does not include supervisors or foremen. BETA considers this to be greater than necessary. It has been stated that each of these positions was created based on a review of the function to be performed and the level of responsibility involved. Assuming this to be true, it would appear that the "Manager" criteria level may have been set too low. It is also possible that GPUN has used grade level as a means to obtain competitive salary levels for key personnel, and generally grade levels are tied to positions. There is no question that GPUN must provide competitive salaries for its personnel. In the lower grades, this is relatively easy. In the higher levels, position descriptions and titles must match the grade level in order to justify salary levels. While there is nothing wrong with this arrangement in the basic structure of the organization, if it is used in excess it will result in there being too many managers.

It is surmised that when the position descriptions were initially written and reviewed, there existed a lack of detailed knowledge of just what the job entailed. This is understandable because of the newness of the organization. Based on this limited knowledge, a grade level was established high enough to cover what was then considered to be the upper limits of the job. Since then, there has been sufficient time to better understand the job and to judge the performance of the individual filling the position. It is BETA's opinion that if those top positions were evaluated today, there would be less managers.

Another bad feature of grade level inflation is the perception of competition between Divisions. Division Directors, Managers, and the workers within the Division tended to use the number of "managers" within each Division as a measure of importance. Throughout the BETA interviews, it was evident that great importance was placed on how high a position was set, particularly when an issue had to be settled between Divisions. We heard of cases where a "manager" would not return a phone call when that call was made by someone in another Division, but at a lower level.

Also, as discussed elsewhere in this report, there is the creation of "cells". In a large measure, this is the result of having too many "managers". Once a person is hired into or elevated to a "manager" position, he tends to want to prove that he really is a manager. Tasks that he would normally perform himself, become chores that are beneath the dignity of his position. As a result, he surrounds himself with a staff. In some cases, noted within GPUN, these staffs or "cells" developed through subterfuge. The "manager" could not openly proclaim he needed a staff so he got an "engineer" or an "analyst". These people, in reality, were assigned administrative tasks, such as budgeting, personnel, etc.

The following table shows the distribution of "managers" in September 1982.

NUMBERS OF MANAGERS AND DIRECTORS

BY LOCATION

DIVISION	PARSIPPANY	TMI	O/C	READING	TOTALS
OP	3	-	-	-	3
O/C	-	-	20	-	20
TMI-1	-	9	-	-	9
TMI-2	-	21	-	-	21
T/F	35	3	3	3	44
N/A	22	9	8	2	41
ADM	40	8	7	-	55
COM	2	6	1	-	9
RC&E	4	12	6	-	22
M&C	8	5	7	-	20
TOTALS	114	73	52	5	244

RECOMMENDATION

An evaluation of the top managerial positions should be conducted to determine if the work performed matches the grade level.

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HUMAN RESOURCES
Labor Relations

FINDING VIII-3

Productivity at the nuclear plant sites is adversely affected by current bargaining unit agreements.

DISCUSSION

The BETA review indicates that operation under the current bargaining unit agreements at both sites is adversely affecting productivity. This is not to say that it is the only contributor. However, there were ample examples of current practices that indicate a need for GPUN or GPU to review its agreements with the bargaining units. BETA did not make such a review for a number of reasons, one being that to do so, would have been too time-consuming since the subject matter is so vast and complex. BETA is aware that this matter is under constant review by GPU management, not only for the nuclear plants but also for the other plants within the system.

BETA has included this item in its findings because it is having a marked impact on work efficiency. If there are truly situations, as were reported to BETA, where a workmen is at his worksite for only two hours out of an eight hour day, then there is a problem. If part of that problem is a result of the bargaining unit agreement, then it should be resolved.

RECOMMENDATION

In this case BETA can only recommend that appropriate but knowledgeable people within GPU (or GPUN) conduct their own review of the situation existing at TMI-1 and Oyster Creek to determine if, and to what extent, current union agreements are impacting work efficiency.

CHAPTER IX

RADIOLOGICAL AND ENVIRONMENTAL CONTROLS

FINDINGS AND RECOMMENDATIONS

CHAPTER IX. RADIOLOGICAL AND ENVIRONMENTAL CONTROLS FINDINGS AND RECOMMENDATIONS

GENERAL

The present structure of the Radiological and Environmental Controls Division (R&EC) is considerably different from that existing prior to the TMI-2 accident. BETA has been more closely involved with assisting GPUN in developing R&EC than any other division. It has been in a position to observe firsthand the many problems encountered in converting what existed in 1979 into the present day organization that can adequately handle the radiological effort at TMI-1 and Oyster Creek.

In October 1979, when BETA arrived at TMI, radiological controls and chemistry for both units one and two were performed by the same technicians. This combined group had two health physicists with degrees in senior positions.

Important early changes that were successfully made were separation of the site chemistry function and removal of production functions, such as radioactive waste and decontamination, from the site radiological controls group. GPU took early action to separate TMI-1 from TMI-2 radiological controls except for a few common functions such as dosimetry.

At Oyster Creek the radiological control situation had many similarities to TMI-1, except that chemistry was not combined with radiological controls. Starting in 1980, Oyster Creek followed the changes that were being made at TMI.

The managers of radiological controls for each of the three plants were organized reporting directly to a new corporate director of radiological controls. More than a dozen manager level leaders were developed in the three radiological control organizations under the Director R&EC. Among other things this has allowed R&EC to gain better control of its contractors such that contractor radiological control personnel are difficult to distinguish from GPUN radiological control personnel at the plants. Changing the radiological control group from the plant organization to R&EC has contributed to improving radiological control performance, partly because the new organization provides better radiological control balance in operations and maintenance.

Radiological engineering groups have been developed within R&EC at each plant. This is a departure from traditional practice in other utilities and it is working effectively. A radiological assessor at each site has also been developed who operates independently from the site radiological control organizations. Standardization of radiological procedures at the three plants is being pushed.

Major early efforts were aimed at improving the training and qualification of radiological control technicians, improving the radiological training of workers, cleaning up contaminated areas and reducing the numbers of such areas, and improving the control of radioactive contamination.

One area not discussed in the earlier sections on radiological control effectiveness at TMI-1 and Oyster Creek is labor relations. It is BETA's

opinion that the current methods and procedures used with the bargaining units interfere unduly with the need to obtain high quality radiological control performance. This report contains a separate item relating to labor relations; however, it is mentioned here with specific reference to the inefficiencies and other problems it has created in performing radioactive work.

In summary, GPUN headquarters has set up strong central control of radiological programs with detailed technical knowledge of current plant problems. This has been performed with a minimum staff at headquarters and without setting up a layer of management between the plant radiological control managers and the Director, R&EC. BETA considers that R&EC has made considerable progress in creating an effective radiological control program at TMI-1 and Oyster Creek. It is on the right track and merits the continued strong support it has received from corporate management. Specific comments relating to areas where effectiveness can be improved are provided in earlier sections in this report (Chapters III and IV).

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R&EC RADIOLOGICAL ENGINEERING

FINDING IX-A

Little radiological engineering is performed at Parsippany.

DISCUSSION

Radiological engineering is needed in technical work for nuclear plants to help ensure consideration of radiation and radioactivity in design and planning. For work on radioactive systems and nearby nonradioactive systems, special attention is needed to radiation exposure of those who will perform the work and to control of radioactive airborne and surface contamination. These considerations nearly always lead to differences in the design and planning from the way the same job would be handled in a nonnuclear situation. Sometimes the differences are major.

These radiological considerations do not require esoteric skills beyond the competence of normal mechanical and electrical engineers. In fact, in a mature, well-trained nuclear power engineering organization, each engineer would be his own radiological engineer. If radiological engineering is not done properly from the earliest stages of planning and design, then design work may have to be redone at increased cost. Or worse, for its impact on cost and time, design work may have to be redone at the plant.

Even in the ideal situation where each engineer does his own radiological engineering, a small radiological engineering group is needed to ensure standardization, to develop new concepts for special jobs, to keep up with new developments elsewhere, to help train the nuclear power engineers, and to ensure coordination with radiological control personnel. To summarize, in a well-trained nuclear power engineering organization, a separate small radiological engineering group will increase efficiency and productivity and reduce overall costs.

The existing situation in Parsippany is far from this ideal. The bulk of the engineers are new to their jobs. They have not had training in radiological engineering. They are not familiar with the best ways to perform radioactive work in an old nuclear plant. Their supervisors similarly do not have enough experience to make up for the radiological shortcomings of their engineers. In this situation, a strong radiological engineering group in Parsippany is essential.

In the Technical Functions Division there are no radiological engineers performing the functions discussed above. There is one engineer assigned the title radiological engineer, but he does analytical work such as shielding calculations and effluent release calculations.

In the Radiological and Environmental Controls Division at Parsippany there is one radiological engineer, but he does not perform the functions listed above. As a result, the radiological engineering group at the plant is relied upon to provide the input that should be available at headquarters much earlier in the design phase. It is too late to add radiological considerations after a design package has been delivered to the plant.

RECOMMENDATION

Develop a small radiological engineering group in Parsippany located in the Radiological and Environmental Controls Division to handle radiological engineering for headquarters divisions. This group should not perform the analytical work on radiation shielding and effluent release which is already properly located in the Technical Functions Division.

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R&EC ENVIRONMENTAL MONITORING

FINDING IX-B

GPUN is spending more than it should in dollars and manpower for environmental monitoring at TMI-1 and Oyster Creek.

DISCUSSION

Environmental monitoring for TMI-1 and Oyster Creek costs approximately $3 million each year, of which more than half is for contractors. Public pressures have been forcing increases in environmental monitoring for nuclear plants. A major cause of such national interest has been concern for radioactivity. This is particularly applicable to TMI-1. Radiological environmental monitoring might therefore be expected to be a large part of the cost of the environmental monitoring program. In fact, however, other environmental monitoring has been increased so much that the costs for the extensive radiological environmental monitoring programs at TMI-1 and Oyster Creek are only a small fraction of the total costs.

RECOMMENDATION

BETA considers this an appropriate time to begin reducing unnecessary environmental monitoring. BETA does not recommend reducing radiological

environmental monitoring. The Director of Radiological and Environmental Controls should be assigned the objective of making initial reductions in environmental monitoring early in 1983 and further reductions by 1984.

CHAPTER X

MAINTENANCE AND CONSTRUCTION

FINDINGS AND RECOMMENDATIONS

CHAPTER X. MAINTENANCE AND CONSTRUCTION FINDINGS AND RECOMMENDATIONS

GENERAL

In the earliest concept of the GPU Nuclear Corporation, long before its official creation as a corporate entity, the Maintenance and Construction Division was included.

Although the creative planning being done at that time made clear the need for such a Division, the planning was reinforced by NRC orders, the Kemeny Report, and the President's response to the Kemeny Report, as indicated by the following excerpts:

NRC Order of August 9, 1979, Docket No. 50-289

> "6. The licensee shall demonstrate his . . . capability of important support organizations such as . . . Maintenance."

The Kemeny Report

> "A.5.(e) Responsibility and accountability for safe power plant operations . . . should be placed on the licensee in all circumstances . . . with particular attention to . . . Maintenance."

The President's Response dated December 7, 1979, to the Recommendations of the Kemeny Commission

> page 7 "Primary responsibility for safety must rest with the utility companies that . . . maintain nuclear power plants."

NRC Order CLI-80-5 dated March 6, 1980

> ". . . the Licensing Board should examine . . . the adequacy of the facility's maintenance program."

On September 15, 1980, the GPUN Group was formed. The M&C Division was established and continues today in the GPUN Corporation.

From that date to the present, the effort has persisted in readying the Division for the assumption of responsibility for all modification and corrective maintenance work at both sites. The transfer of the corrective maintenance function from the plant to M&C is currently in process at Oyster Creek, having commenced in October 1982 and is planned for TMI-1 after the restart of that plant.

BETA has observed closely during the formation of M&C from the date the Vice President-Director, M&C reported in June 1980 as the Vice President designate, and BETA agrees with the intent, method, and scope of the new organization. It is anticipated that when the organization is fully in place and functioning as planned that the material condition of the plants will be improved and that the performance of all maintenance and modification work will be better controlled as regards procedure compliance, schedule, and cost.

As previously noted, the transfer of plant maintenance work to the M&C Division has commenced at Oyster Creek. In conjunction with the finding listed below, attention is directed to the finding contained in the Oyster Creek section of this report which discusses a number of problems observed in the maintenance area at Oyster Creek as this transition occurs.

Since, during the time of the BETA review, the main effort of the M&C Division has been one of getting itself in a position to assume its new role, there is little that can be commented on with respect to work accomplishment. BETA did spend time reviewing the plans, goals and procedures being devised for operating the new division. Because of the unique nature of the working relationships which need to be established and their departure from past practices, it is expected that a number of problems will develop. It is not BETA's purpose to list these problems because they will be resolved as the transfer proceeds. However, managers and directors in all affected divisions need to:

1. Understand that the decision to transfer plant maintenance to the M&C Division has been made—it is no longer a debate.

2. Put whatever disagreement they may have felt regarding this change in the past and they now need to support it.

3. Help resolve the issues arising as a result of divisional interface uncertainties.

BETA is confident that these problems will be worked out and that this new concept of performing maintenance work at the plant will result in a better maintained plant and a greater efficiency in doing so.

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M&C

FINDING X-A

The Maintenance and Construction Division in its effort to become established is not capitalizing on the capabilities throughout the Corporation's functional organization.

DISCUSSION

It is BETA's opinion that in establishing the functions, assignments and responsibilities of the M&C Division, particularly in its early stages, there has resulted an overshift into M&C of a number of functions that should be retained by other divisions. It is understandable how this came about, namely the need to create a new effective system drives a new organization into assuming more of the roles. In theory, the M&C organization with all of its various functions looks good on paper. However, it is not likely to succeed unless reliance is placed on other divisions within the corporation to carry out their duties. M&C should not overdo the philosophy that a function will not be done properly unless it is done by M&C.

There are a number of examples of this. Within the site M&C organization there is a group called Technical Support. Care must be taken that this group does not take over the function of Plant Engineering or Technical Functions. In addition, care needs to be taken that this group does not duplicate the work of others or does not become another approval point in series with getting the work done. This same situation is tending to exist in such areas as: contract administration, warehousing and welding engineering. There may be others.

RECOMMENDATION

The Vice President, M&C should review his organizational plans and procedures to ensure that wherever a function already exists with GPUN, that function should be used to the fullest and not duplicated within M&C just because it is not supportive. If it is nonsupportive, action needs to be taken with the appropriate division director to correct the situation.

CHAPTER XI

COMMUNICATIONS FINDINGS AND RECOMMENDATIONS

COMMUNICATIONS
Staffing

FINDING XI

The number of people assigned to this function appears excessive.

DISCUSSION

BETA fully understands and supports the need for GPUN to have an effective Communications Division. The unique nature of circumstances surrounding TMI dictate the need for GPUN to have a group dedicated to this purpose and also the need for this group to be larger than in any other nuclear utility. However, we do feel that having 36 people to perform these tasks is excessive. A few times throughout the period of the BETA review, there were opportunities to observe the day-to-day functioning of this group at TMI. Based on these isolated cases it is BETA's opinion that a number of the people are under-utilized, lack supervision and are sometimes performing questionable tasks. This is undoubtedly caused by the fluctuating need for their services and the desire to have people available when the need arises. BETA does feel that it is appropriate at this time to review the manning of this group to determine if all the people are really necessary.

RECOMMENDATION

a. A review should be conducted of the anticipated work load of this Division to determine if it is properly manned.

b. Consideration should be given to finding useful tasks in other Divisions for people in this Division when they are not needed for their primary jobs.

c. More effective supervision should be provided, particularly at TMI.

CHAPTER XII

GENERAL FINDINGS AND RECOMMENDATIONS

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GENERAL
Supervision

FINDING XII-A

Insufficient or poor supervision is contributing to poor productivity.

DISCUSSION

Probably the most effective measures GPUN can take to improve productivity throughout its organization is to improve supervision. During the time BETA conducted its review at the three sites, numerous observations were made where people were not productivly employed. There are a number of reasons why situations such as this develop. In order for a worker to be productive he or she needs all the elements necessary to do the job. The absence of any one of them will cause the work to stop. Many of these elements are discussed elsewhere in this report. The purpose of this item is to discuss supervision or the lack of it.

In its observations, BETA noted too many cases where poor productivity could be directly attributed to either insufficient or improper supervision. Even though the more flagrant cases occurred at Oyster Creek, the same situations were noted at the other two locations. While BETA could provide a list of specific examples noted, it is felt that most of senior GPUN management is already aware of similar examples from their own observations. What needs to be recognized is that this problem exists to varying degrees at <u>all</u> levels in <u>all</u> divisions and is not restricted to the man with a bag of tools.

BETA recognizes that merely recommending an improvement in supervision provides little if any help in solving the problem. What follows is a list of possible contributing causes as surmised by BETA along with some suggestions as to how they might be relieved. This list is not in any order of priority or importance.

a. Greater than normal rates of increases in manpower such as have occurred at GPUN, generally result in a drop in the quality of supervision. This is brought about by several factors. People are promoted into supervisory roles at a faster rate than the organization can assimilate them. Also, managers will tend to hire new people more for their specific capability to do a given job and less for their supervisory capabilities, particularly when there is pressure on to build up an organization in a short period of time. Rapid hiring contributes to reduced supervisory capability in another way. New people are generally hired because the work load has increased. As the new people are brought onboard there is a period of time when their ability to do the work is very low. This means that the senior experienced people spend most of their time doing the work that they hired the new people to do, and the result is that no time is left for these senior experienced people to train the new hires, particularly in matters of supervision.

b. Looseness of supervision tends to become a way of life and as time goes by, it becomes embedded and is very difficult to change. Quality supervision tends to atrophy with time and needs to be constantly reinforced. BETA too often heard the expression, "things will never change, they have been that way too long".

c. Too often people are made supervisors who, if the truth were known, really do not want to be supervisors. Some people have an inherent distaste for being a boss. Others have grown up in a community of peers, having been close personal friends with them for years and are unwilling to alienate those relationships even though they may take the job when offered.

d. Senior managers tend to look no further than one level down in their own organization when it comes to supervisory attention.

e. Senior managers, including Division Directors, are particularly reluctant to flag poor supervision on the spot, when it occurs in another Division.

f. Some senior people truly believe that all that is necessary to solve the problem of poor supervision is for the Training and Education Department to have an effective supervisor training course. If it isn't working it's because the training course was no good. This becomes a convenient crutch because now all the managers need to do is make sure their people are scheduled to take the course. Incidentally, BETA strongly supports the need for having a well-taught supervisor training course, as long as it does not become the sole means to an end. BETA also feels that the current trend to turn supervisor training courses into psychological exercises is wrong.

g. Too many senior managers want to create the impression that they are "good guys", and that their people "love" them. They have not learned that there is a difference between being tough and being mean. People will respect a person who is tough, but fair, and one who knows his business.

h. Supervisors and managers have a better chance of success when their personal appearance reflects their elevated positions. This applies to dress, grooming, demeanor and any other attribute that tends to create an image. In the same light, what a person does outside of working hours should generally be of no concern to the company unless that behavior becomes grossly offensive and ends up hampering his ability to supervise.

i. Obtaining effective supervision starts at the top. If top management does not set the tone and constantly reinforce it, it will slacken as it moves down into the organization.

j. Some senior people assume that when a person is promoted to a higher position, he or she automatically becomes qualified, in a managerial sense, to perform in that position. This is rarely true.

k. Poor supervision will result in a company where the failure to meet schedules or commitments has become a normal everyday routine. Employees soon develop an attitude that, "if they (the bosses) don't care if it gets done on time, why should I?" In a larger but different sense, the constant inability to get TMI-1 restarted contributes to this.

l. There is a reluctance for GPUN managers/supervisors to flag poor supervision on the part of contractors. There is the perception that for contractural reasons, GPUN people are not permitted to move into this area.

m. There is the erroneous perception (more an excuse) that union agreements have tied the hands of the supervisors.

n. Supervisors do not spend enough time at the work sites. This could be for a number of reasons: they have too much desk work; they attend too many meetings; they are running around chasing problems holding up their work; they just don't want to.

o. Supervisors are not sensitive to, and are not reacting to, poor working conditions at the work sites, such as, too many jobs going on in the same area, cleanliness, etc.

p. Supervisors too often rely on outsiders (QC, Radcon, etc.) to ensure quality of the work rather than themselves.

q. Supervisors, on occasion, blame others for inability to get the work done but seldom do no more to correct the situation than complain to their own workers.

RECOMMENDATION (not in order of importance or priority)

a. Most of the causes given above relate to a lack of proper training of supervisory personnel and to a lack of awareness on the part of senior managers that the supervisors are not properly trained. The first step in improving this situation must start in the Office of the President. That office must set the tone, not by preaching, but by visible signs that they are concerned, including calling to the attention of individual division directors, noted examples of poor supervision.

b. A review should be made of the current supervisor training course to ensure it is providing the material and is being taught by people who are qualified to teach it. Evaluation of the effectiveness of these courses should not be performed by the Training Department.

c. Management should recognize that 90% of effective supervision training is on-the-job. This means that managers, etc., must constantly be in the process of teaching their people how to supervise and correcting their mistakes. This assumes that management is capable.

d. Directors (all divisions) need to tour their work areas at irregular and unannounced times with the express purpose of seeing that their people are gainfully employed, and if they aren't, why. When cases of inactivity or laxness are noted, these directors need to raise the issue with the appropriate managers.

e. Senior managers need to improve their use of GPUN performance evaluation system's provisions relating to supervisory performance. At the present time this tends to be perfunctory because of a lack of realistic knowledge of the person's performance in this area.

f. The rapid rate of hiring has subsided and there should be evidence of better supervisory performance. As the new people learn their jobs better, managers should be encouraged to devote more of their time to teaching their people. This will not happen naturally. It is harder to deal with people problems than it is to deal with paper problems.

g. Known cases where people have been put in supervisory roles who find that role repugnant need to be flagged and worked on. If that feeling persists, then the person should be moved into a non-supervisory position.

h. Senior management needs to be conditioned to react to poor supervision whenever it is observed, be it outside their division or within contractor organizations.

i. It might be beneficial to review the provisions contained in contracts GPUN has with its major contractors to see what means exist for GPUN to monitor, report, and take action in cases of poor or insufficient supervision.

j. BETA does not subscribe to instituting a formal productivity monitoring system or a work/product sampling system. It is our feeling that such systems do more harm than good. Efforts spent in making supervisors more effective pay higher dividends. However, there may be some benefit to using data which is collected for other reasons to get some gross indications of productivity trends. For example, returned costs on jobs of a repetitive nature can be trended. Total calendar time between start and complete dates on repetitive jobs can be compared. Total man-rem exposure on similar jobs can be compared. Records of QC rejections or rework can be trended. Supervisor man-rem exposure in contrast to his work force can be compared. All of these can provide some small measure or indication of problem areas.

k. In the case of personal appearance, demeanor, etc., no rules or written procedures are necessary or desired. They can't be written. What is needed is an awareness of higher management to cases that clearly fall outside the norm, followed up with corrective action.

l. At the plant sites, hard hats should be distinctively color-coded so that there is a visible means of identifying workers, supervisors/foremen, and officers (managers and above). Major contractors should be required to follow this practice.

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GENERAL
Paperwork

FINDING XII-B

There is too much paper being generated and distributed throughout the GPUN organization.

DISCUSSION

One area which would appear to provide room for improvement and would make more efficient use of manpower is tighter control of paper - all forms of paper. Not only is this a constant source of complaint, but our observations indicate that it is real. The following areas need correction:

a. Distribution - Documents prepared within GPUN, as well as those received from the outside, carry distributions throughout the GPUN system which are much more extensive than necessary. The intent is understandable, but the result is that too many people receive documents which they have little or no interest in, but because they receive them, they feel obligated to read them. We saw numerous examples of this.

b. Signature/Addressee - There are instances where people within GPUN sign internal memorandums to people outside their Division who are senior to them. If these memorandums were strictly the passing along of information, it might not be too bad, but that is not the case. In one case, a person two levels down in the organization directed 8 Vice Presidents to do something. In a similar vein, apparently anyone in GPUN can sign out a memorandum or letter. This is dangerous and can lead to problems. Some form of control should be exercised over who can sign correspondence to whom. This is already done in the case of expenditure approval authority.

c. Correspondence Control - With the exception of Licensing and the NRC, it would appear that some better form or system of correspondence control is needed. There exists a rather massive computer system for keeping track of "key" documents, but as far as we can see, it does not control the correspondence, i.e., due dates for responses, etc. Each division and section has their own, which may be all right, but that will not keep management up-to-date on how well commitments are being met.

d. Over-Abundance of Procedures - With the creation of the GPUN functional organization, each division obviously felt the need to formalize their way of doing business. Therefore, each division

initiated the task of preparing procedures on just how their work would be done, not only within their own division, but in all other divisions. These draft procedures were, and are, routed around for comment. However, because of the large number of new procedures and the fact that each division was producing their own, less time than desired was put into the review of others. The result is that many of the procedures are not compatible from one division to another, and what is worse - there are just too many of them. It is literally impossible for any one person to even begin to absorb what is in those documents. There are more than 2000 procedures just for TMI-1 alone. We do not fault any of these 2000 procedures because they cover the areas needed to operate and maintain the plant. However, if some brake is not applied, each division will have 2000, and GPUN will be faced with trying to get over 15,000 procedures updated, reviewed and followed. Writing a procedure seems to be the easy way to solve a problem. Then once a procedure is written, supposedly the problem is solved and the burden shifts to the person at the bottom who is supposed to follow it.

e. Concurrences - Too many people are being required to concur in documents (procedures). This, in combination with the previous comment on the large number of procedures, places an impossible burden on the system. What can happen is that people are forced to concur in documents they do not read or do not read thoroughly unless they have some personal and direct interest. Obviously, each document needs to have some number of concurrences, but as it is now, that number is far too large. It is up to division directors and their immediate subordinates to slow this down.

RECOMMENDATION

a. Distribution

Each division director should take on the issue as a particular case arises. If he is sensitive to the problem and reacts with his own people to hold down the distribution, some headway can be made. It will do no good to issue a procedure or directive on a matter such as this.

b. Signature/Addressee

Apparently action has already been taken to tighten up signature authority in certain areas. This area should continue to be watched and division directors should react to cases of noncompliance.

c. Correspondence Control

A simple system of controlling correspondence should be instituted, at least to the point where the directors have some idea of how well their own people are meeting commitments. BETA is not proposing the creation of another new massive control system.

d. Over-Abundance of Procedures

The proper operation of a nuclear plant requires the existence of procedures. Each division needs procedures to set forth its methods of operation. The question here is how much is enough? There, obviously, is no absolute answer to this question; however, each division director should realistically make a judgment as to the necessity for creating a new procedure, taking into account not only what is gained, but what problems are created. This is particularly important in nuclear plants where verbatim compliance is becoming more and more the rule. Discounting plant operating procedures, which are not meant to be included in the thrust of this comment, all procedures need to be judged on the basis of necessity, keeping in mind the need to keep things as simple as possible.

e. Concurrences

The action taken by the Office of the President to resolve this issue is having effect and should be continued.

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GENERAL
Decision-Making Process

FINDING XII-C

There is an overall tendency within GPUN to force decision-making up too high in the organization.

DISCUSSION

Throughout the course of the review, BETA repeatedly heard the complaint that too many decisions are made at too high a level. This perception was noted across the board, in all divisions and at all locations. It was felt by those interviewed that this phenomenon originated at the level of the Office of the President and then worked itself down the organization. In this regard it was interesting to note that division directors would make this observation about the Office of the President while at the same time, senior people within those divisions would offer the same comment about their director, and so forth down the line. In some cases this escalation was blamed on administrative corporate policy procedures (example, limit of signature authority).

Concurrent with the feeling that decision-making is forced upwards, is the perception that decisions made at the top are too often made by consensus. There is be a natural tendency towards this approach in a functional organization. However, it was noted that too many decisions are put before all of the division directors for their concurrence even though many of them will have no direct involvement. There are certain decisions made by the Office of the President that are either controversial or

distasteful that need to be made with consultation, but not necessarily with consensus.

Having decisions made at higher than normal levels can be expected in newly-formed organizations and ones having large numbers of new people in managerial positions. These people are inexperienced, and in many cases, have yet to understand the intricacies of their jobs, where top management is headed and their roles in relation to other managers. As time goes on, this situation should change and higher levels of management should have developed a greater sense of confidence in these people, allowing decisions to drop back down to a reasonable level in the organization. BETA feels this has happened to some extent but not to the point where it should be.

One result of decisions being forced too high, and it is a major element of this review, is that it takes an inordinate amount of time (and money) to get anything done. We attempted to track a number of cases to illustrate the point, and while each case had its unique aspects, the overall pattern was the same. First, a potential problem or need was identified. This was followed by a rather lengthy, involved process to decide if there really was a problem or need. Depending on the issue, this process worked itself through a number of the divisions, taking weeks to resolve. The same process was then followed on arriving at a solution. By the time the decision was carried out (the work done), several months had elapsed and, in some cases, the fix was changed several times. BETA fully recognizes that the very nature of the nuclear business requires careful and detailed analysis of problems and their solutions. It would be foolhardy and dangerous to make snap decisions involving the technical aspects of the plant. Our concern is the feeling that too many problems are floated to the top and that all issues are treated as if they were of equal importance. There will always be some fine thread which can be used to justify the need to elevate the importance of an action. Management must be in a position to use its judgment.

Another result of this situation is the feeling at the lower levels that by sharing the responsibility for decision-making among many, somehow no one person has to take the full brunt of the blame if things go wrong, and since they share the responsibility, they are not expected to be fully cognizant of the entire job. Besides there being each division with its own ad hoc internal review groups, there are innumerable established committees, that come into play depending on the matter involved. In some cases, this is necessary and required. However, to the extent possible, decisions should be made by the person responsible, placing on him the burden to satisfy the others within the functional organization. Conflicts between divisions obviously need to be settled by the Office of the President.

The problem described herein should not be interpreted to apply solely to the Office of the President. It manifests itself throughout the entire organization at all levels.

RECOMMENDATION

All levels of management should make a concerted effort to review the decision-making process within their groups with the purpose of having decisions made at the proper level commensurate with the need. This should not result in a written procedure. It should come about as a result of action

taken by the Office of the President and the division directors on a case-by-case basis.

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GENERAL
Handling Poor Performers

FINDING XII-D

There appears to be a reluctance within the GPUN system to take action either to improve the performance of poor performers or to terminate their employment.

DISCUSSION

A fairly large number of GPUN people interviewed commented that action is not taken to correct, transfer or discharge known poor performers. We asked a number of managers if they had working for them people who were not contributing to the job as expected, and if they would be better off without them. In almost all cases, we were told that they did have at least one out of ten who fell in that category. In some cases, the number was as high as three out of ten. When asked why they had not done anything about this, the answer was usually that it was too hard (impossible) to fire anyone. Further questioning also revealed that the Manager had done little on his own to correct the poor performer.

There are a number of issues involved here. First, there is an administrative procedure in existence which covers the termination of a GPUN employee for poor performance. It is not clear that people are willing to follow it. This might be a problem relating to the manager involved, or with the GPUN procedure. Secondly, the fact that managers are not actively attempting to improve the performance of their people is a problem. Finally, there is a problem if individual managers are not doing anything to thin their own ranks of marginal performers. If every manager felt he could accomplish the same amount of work with 10 percent less people, then a large part of the cost problem would go away. Incidentally, in a number of cases, these same managers were asking for increases in their manpower for 1983.

Telling an employee that his performance is poor is usually a distasteful job and one which "managers" will avoid. But that is a necessary burden of supervision.

RECOMMENDATION

a. A review should be made of the GPUN procedure, which tells people what to do with poor performers, to find out if it is too cumbersome, causing people to shy away from it.

b. Division directors should review the issue of poor performance with their managers to ensure that:

(1) Action is taken to correct the performance of their people when called for.

(2) When this has been done to a reasonable extent, and the employee's performance still has not been satisfactory, then steps are taken to discharge the employee.

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GENERAL
Staffs

FINDING XII-E

Since the creation of GPUN, too many small groups (cells or staffs) have been formed to carry out functions which should be handled within the normal functioning groups.

DISCUSSION

Throughout the course of the BETA review, situations were noted where small groups or staffs had been created throughout all levels of the organization and in all divisions. These small staffs have grown in size and number. In some cases a "manager" will create such a staff in order to enhance his image or maybe to solve an immediate (but temporary) problem. The issue is not that the function need not be performed, it is that a staff has been created to do it.

RECOMMENDATION

Each division director should review his manpower staffing so that he knows what each person and group is doing. Every effort should be made to reduce the number of staffs that have been created down within the organization.

CHAPTER XIII

COMPARATIVE ANALYSIS RESULTS

CHAPTER XIII. COMPARATIVE ANALYSIS RESULTS

A. SUMMARY

The results of the BETA analysis of the manpower and cost data obtained from a number of other utilities indicate that the data provides some useful information but only very limited conclusions. It raises more questions than it answers. It was worthwhile for GPUN to have made the effort to obtain the data and it would be of some benefit to keep the data current in an attempt to make it more meaningful.

The data suffers from inaccuracies for a number of reasons explained later in this chapter. Nevertheless, it does highlight areas which GPUN should take a second look at. It shows, in an overall sense, that both Oyster Creek and TMI-1 have more people than any other plant. It shows that both of these plants have exhibited higher costs since at least 1975, and that the higher costs evidenced since GPUN was created is not a new phenomenon. It has provided BETA with at least a benchmark or point of departure in arriving at recommended manning levels for Oyster Creek and TMI-1. It reflects a growing trend at all nuclear plants over the past several years not only as a result of inflation but of an increasing demand by regulatory bodies, the public, etc., to have the utilities cover more things in more detail and with more people. It shows the need for GPUN to take a look at itself, as it is doing, and to attempt to settle down and make the present organization more stable and effective.

It would be a mistake to try to use the comparative data in isolation to prove or disprove the validity of any one category. The data is not that accurate. It would also be a mistake to discount totally the data and say it does not mean a thing. The data has a message, but judgment is needed to use it properly.

B. OBJECTIVE

The comparative analysis effort was aimed at attempting to uncover areas of costs and manpower within GPUN which were noticeably out of line with other plants of similar design and age. At first thought, one would think that such data would already be in existence, or, if not, would be relatively simple to obtain. Unfortunately, neither of these situations exists. For example, each privately owned utility is required by law to submit a detailed financial and manpower report annually to the U. S. Federal Energy Regulatory Commission (FERC) now part of the Department of Energy. In the early stages of its review, BETA reviewed these annual FERC reports from some 50 nuclear utilities. Based on this review, it was concluded that, for one reason or another, no meaningful information could be derived from them. It was clear that each utility interpreted the form differently and to suit its own individual needs. This was true in both manpower and cost figures.

It was also noted that several other organizations had attempted to collect data from the nuclear utilities along these same lines (EEI and INPO). BETA reviewed these results and again, concluded that the data could not be used for this purpose.

Finally, it was agreed that through the efforts of GPUN, a number of nuclear utilities would be contacted and asked to cooperate in amassing data. This was done and it is this data that is being reported on.

The requested data fell into two main categories; manpower and costs. An effort was made to attempt to define the breakdown in each of these categories in such a way that there would be no confusion as to what was meant. Even doing this and with GPUN people personally visiting many of the sites, BETA concludes it is doubtful that the results can be used for much more than just gross indicators.

In an overall sense, it is BETA's opinion, after reviewing the data that has been collected, that it suffers many of the problems evidenced in the FERC reports and other surveys. The GPUN manpower data is accurate because there was no question as to the meaning or interpretation of the categories. The GPUN cost data is as accurate as the data which exists in the company records, which does not mean it is 100% accurate insofar as allocation is concerned. Data from the other utilities varies in accuracy downward from there.

Knowing that this was the situation, BETA attempted to cull from this data any area where the evidence clearly points to a problem within GPUN. This was the objective.

C. METHOD OF APPROACH

The survey involved 9 nuclear utilities owning 12 operating BWR plants and 7 utilities owning 10 operating PWR plants. Totally this involved 14 different utilities, and 15 different sites. Due to prearrangements with the participating utilities, the identification of the utilities and the plants was to be withheld.

Each utility was provided with an explanation of what was needed and a questionnaire to be filled in. For each, someone from GPUN (or another utility) visited the utility site in order to help ensure accurate data.

In the manpower area there was the desire to know:

1.	the job being performed (title)	(104)*
2.	the profession (engineer, tech, etc.)	(19)
3.	the job location (onsite/offsite)	(2)
4.	the employer (system/contractor)	(2)

* categories

All of this data was then entered into a computer so that any given area could be analyzed from a number of different perspectives. It was this data that BETA analyzed.

D. MANPOWER ANALYSIS RESULTS

As previously indicated, the manpower data suffers from a number of faults which make its value as a means to compare different utilities very limited. Some of the more significant inaccuracies arise for the following reasons:

1. Because of the wide variations reported in any given category, either the various utilities misunderstood the definitions or they categorized their positions differently. This problem can only be resolved by GPUN people spending much more time at each site, interviewing a large number of managers, and compiling their own set of data based on firsthand knowledge. It is doubtful that the various utilities would ever agree to undertake such an effort.

2. Recognizing that there is little to be gained from comparing each individual line item, the tendency is to combine a number of them into larger groups with the hope that the larger groupings will cancel out the variations. This proved to be of some benefit but still suffered from one significant problem—contractors. All utilities use contractors for some purposes. As in the case of GPUN, there are three ways to use contracted help. One is to put a contractor into a position normally occupied by a utility employee because either a person cannot be found to fill the job or because it requires special talents needed for a short period of time. Another way to use contractor help is to farm out specific work tasks to an architect/engineering firm. Normally the work is performed at the contractor's home office. The third use of contractors is for major jobs, usually construction or modification work which is done at the site during an outage. There are numerous variations on each of these three forms of contractor effort, such as guard forces, vehicle maintenance, etc. The problem with the manpower data is that each utility counts its contractors differently, some not counting them at all, others only counting certain categories of them. Since the number of contractors can have a significant effect on levels of manpower, not knowing how each utility counted them, makes even the combined numbers suspect.

3. Another problem encountered in attempting to understand the manning data relates to the use of resources belonging to the corporate utility but not coming under the nuclear structure. A good example is the use of a corporate mobile maintenance group. This is a group of maintenance people who are used as the need arises at all of a utility's plants, nuclear and otherwise. From a manpower standpoint, they are not counted against any one plant and usually no effort is made to allocate their services. The same situation exists with some engineering groups. If these numbers are not included in the comparative data, then the data has a major flaw.

4. Still another uncertainty arises when consideration is given to whether the numbers reported reflect actual onboard numbers or intended levels. While the instructions were clear that each utility

was to report approved levels (not onboard), a review of the data indicates this instruction was not always followed, primarily because a number of the utilities do not have such a system. They carry so many on the rolls, and if the need arises they get approval on-the-spot to hire additional people. What this means is that in some cases a utility knows it is going to increase its staff within the year in a given area, but this isn't reported because the process hasn't reached the point where they can report the increase. BETA is aware of a significant number of situations where this condition exists.

5. Once all these uncertainties are understood, there is little hope that any detailed analysis of the manning figures will yield a meaningful conclusion. As previously noted, it is possible to resolve these uncertainties to a large measure, but it would require sending several GPUN people to each utility for extended periods of time. BETA is not convinced the results would be worth the effort.

Thus, except for providing some insight into specific cases where GPUN manpower allocations might be high, the breakdown by individual job assignments provides only a vague insight to the overall situation. BETA has used as much of this information as it deems appropriate in arriving at the recommendations contained in this report.

The following three tables summarize the total number of people assigned to a plant on the basis of onsite, offsite and totals for both system people and system plus contractor people, onsite and offsite.

TABLE 1

A tabulation of the total average number of onsite people per plant is listed below:

Plant	Utility Only	Utility & Contractors
1	184	244
2	194	247
3	199	257
4	211	308
5	280	355
6	280	355
7	303	479
8	344	458
9	365	370
10	410	448
11	453	526
12	462	478
13	463	718
14	464	545
15	745	779.5 (TMI-1)
16	813	877 (Oyster Creek)
Average	386	462

TABLE 2

A similar listing of offsite personnel average on a per plant basis shows the following:

Plant	Utility Only	Utility & Contractors
1	27.5	50
2	49	161
3	62.3	108.3
4	72.8	75.2
5	75.7	75.7
6	90.8	91.2
7	106.9	122.9
8	128.4	157.2
9	130	130
10	152	152
11	176.7	182.5
12	176.7	182.5
13	182	219
14	193.7	193.7
15	186	198. (TMI-1)
16	244.5	256.5 (O/C)
Average	128	147

NOTE: Plant designation numbers on Tables 1, 2, and 3 do not necessarily indicate the same utility/plant.

TABLE 3

A tabulation of the total average number of people per plant, both offsite and onsite indicate the following:

Plant	Utility Only	Utility & Contractors
1	256.8	319.2
2	284.8	338.2
3	306	380
4	286.7	384.2
5	393	420
6	456.9	527.7
7	456.9	527.7
8	472.8	555.8
9	592	608
10	431.4	636.2
11	526	677
12	616.7	697
13	646.7	719.7
14	512	879
15	931	977.5 (TMI-1)
16	1057.5	1133.5 (Oyster Creek)
Average	514	611

These listings would lead one to conclude that both Oyster Creek and TMI-1 are heavily manned but, for reasons already advanced, care must be taken in giving too much credence to them in isolation from other considerations.

The tables which follow are summaries prepared by GPUN based on a survey of the manpower numbers provided by the various cooperating utilities. These tables reflect manpower allocation by division using GPUN organizational structure. They do not differentiate between onsite and offsite but do show totals.

BWR PLANTS - MANPOWER COMPARISON
FUNCTION BY PLANT AND SURVEY AVERAGE

	PLANT B	PLANT C	PLANT D	PLANT E	PLANT F	PLANT G	PLANT H	PLANT I	Survey Average (Excl. OC)	Oyster Creek
PLANT DIVISION:										
Operations	63.0	45.0	48.0	44.0	50.5	62.0	75.0	45.0	54.0	74.0
Radwaste Operations	3.0	3.5	0.0	11.0	3.5	3.0	0.0	0.0	5.0	36.0
Maintenance:										
Correc./Prevent. Maint.	69.0	68.0	28.0	93.0	142.5	73.0	93.5	50.0	77.0	106.0
Planning/Sched./Admin.	4.0	2.0	0.0	2.0	7.0	0.0	.5	0.0	3.0	5.0
Utility/Decontamination	0.0	0.0	5.0	0.0	43.5	30.0	26.0	0.0	26.0	69.0
Outage Planning	3.3	1.0	2.6	0.0	6.5	0.0	1.5	0.0	3.8	4.0
Plant Engineering	26.0	8.5	26.0	42.0	25.5	15.0	36.0	17.0	24.5	41.0
Chemistry	9.5	9.0	12.0	9.0	11.0	8.0	12.0	7.0	10.0	21.0
Subtotal	177.8	137.0	121.6	201.0	290.0	191.0	244.5	119.0	202.5	356.0
TECHNICAL FUNCTIONS:										
Shift Technical Advisors	0.0	4.0	6.0	9.0	3.5	12.0	0.0	7.0	7.0	12.0
Nuclear Engineering	7.2	7.6	11.1	0.0	7.0	7.0	3.0	15.0	7.5	11.0
Mechanical Engineering	7.4	1.7	1.3	7.0	14.5	10.0	5.0	5.1	6.5	17.0
Electrical Engineering	5.2	.5	1.5	7.0	8.1	14.0	2.0	2.4	5.0	6.5
Structural/Civil Engrng	3.8	.5	1.0	5.0	2.5	9.0	2.0	0.0	3.5	0.0
Drafting & Design	22.9	.5	7.7	31.0	26.5	11.0	9.0	2.8	15.5	20.5
Project Engineering	1.0	8.0	15.0	13.0	2.0	10.0	3.5	2.0	7.0	22.0
Nuclear Fuel Management	4.1	0.0	2.0	3.0	2.5	2.0	0.0	0.0	3.0	0.0
Process Computer/Anal/I&C	8.8	9.0	3.0	12.0	5.5	9.0	0.0	6.0	7.5	15.5
Start-Up & Test	0.0	0.0	1.9	0.0	.5	0.0	0.0	0.0	1.5	15.5
Other Engineering	37.4	14.6	3.6	21.0	5.3	51.0	7.0	9.3	18.5	48.3
Licensing	7.3	1.8	3.5	5.0	5.5	5.0	3.0	1.3	4.0	10.0
System Lab.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
Subtotal	105.1	48.2	57.6	113.0	78.4	140.0	34.5	50.9	79.0	190.8
NUCLEAR ASSURANCE:										
Emergency Preparedness	2.5	1.2	2.5	2.0	2.5	3.0	.5	2.6	2.0	6.0
Quality Assurance	13.5	3.6	16.5	9.6	20.5	16.0	5.0	6.9	12.0	35.2
Quality Control	13.3	4.3	12.0	6.4	1.1	18.0	11.5	0.0	9.5	15.0
Nuclear Safety Review	4.6	1.8	.5	0.0	4.0	0.0	0.0	0.0	3.0	3.0
Training & Education	19.6	20.5	26.1	21.0	9.0	18.0	10.0	7.0	16.5	28.4
Subtotal	53.5	31.4	57.6	39.0	37.1	55.0	27.0	16.5	43.0	97.6

BWR PLANTS - MANPOWER COMPARISON
FUNCTION BY PLANT AND SURVEY AVERAGE

	PLANT B	PLANT C	PLANT D	PLANT E	PLANT F	PLANT G	PLANT H	PLANT I	Survey Average (Excl. OC)	Oyster Creek
ADMINISTRATION:										
Budgets/Cost/Support	2.0	1.3	1.8	4.0	1.0	28.0	2.5	1.0	5.0	16.5 (8 Acct.)
Doc. Control/Records Mgmt./Computer	15.0	8.3	8.0	23.5	23.2	36.0	3.8	4.4	15.5	20.8
Info. Mgmt/Library/ Word Processing/Clerical	9.2	7.5	4.0	21.0	7.5	0.0	3.7	8.4	9.0	31.4
Operations Analysis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.6
Human Resources (Personnel)	0.0	0.5	4.0	3.0	5.0	0.0	3.0	1.1	3.0	16.9
Security	80.0	51.8	60.5	88.0	43.3	73.0	45.0	50.8	61.5	54.9
Facility Maintenance	15.0	16.0	8.0	12.0	9.0	0.0	0.0	5.0	11.0	35.0
Safety & Health	1.0	0.0	.9	0.0	3.1	0.0	.5	1.5	1.5	5.9
Contracts	0.0	.5	1.0	0.0	.3	0.0	0.0	0.0	.5	6.2
Procurement/Purchasing	0.0	.8	3.0	0.0	.8	0.0	1.0	3.0	2.0	4.8
Storeroom/Warehouse/ Materials Control	11.5	6.0	3.0	7.0	11.5	4.0	11.5	6.0	7.5	21.4
Subtotal	133.7	92.7	94.2	158.5	104.7	141.0	71.0	81.2	116.5	196.6
COMMUNICATIONS:	0.0	.4	0.0	3.0	1.5	0.0	0.0	0.0	1.5	7.0
RAD. & ENV. CONTROLS:										
Environmental Controls	8.2	4.2	1.0	4.0	6.1	3.0	.5	7.8	4.5	14.4
HP/Dosimetry	6.0	3.5	5.0	6.5	4.5	34.0	5.5	14.0	10.0	19.0
Radiological Controls	22.9	14.7	9.0	45.0	33.0	28.0	11.0	3.5	21.0	67.9
Rad. Engineering/ALARA	1.5	1.0	2.0	1.5	2.0	2.0	0.0	0.0	1.5	9.0
Subtotal	38.6	23.4	17.0	57.0	45.6	67.0	17.0	25.3	37.0	110.3
MAINTENANCE & CONSTRUCTION:										
Field Construction	0.0	0.0	0.0	0.0	50.5	0.0	.5	0.0	30.0	45.0
Technical Support	5.4	42.0	15.0	0.0	15.8	31.0	6.5	1.3	16.5	21.4
Administrative Support	4.6	0.0	0.0	2.0	7.0	2.0	0.5	0.0	2.5	14.8
Subtotal	10.0	42.0	15.0	2.0	73.3	33.0	7.5	1.3	49.0	81.2
MAINT. ADMIN. 1ST LINE SUPV.:	19.0	8.5	17.0	34.5	4.9	50.0	20.5	23.0	22.0	90.5
GRAND TOTAL:	537.7	383.6	380.0	608.0	639.5	677.0	422.0	319.2	550.5	1,130.0

UTILITY MANPOWER COMPARISON
BWR PLANTS - PER UNIT BASIS

	PLANT A			PLANT B			PLANT C			PLANT D			PLANT E		
	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL
PLANT DIVISIONS:															
Operations	74.0		74.0	63.0		63.0	45.0		45.0	48.0		48.0	44.0		44.0
Radwaste Operations	36.0		36.0	3.0		3.0	3.5		3.5	0.0		0.0*	11.0		11.0
Maintenance:															
Correc./Prevent. Maint.	106.0		106.0	69.0		69.0	60.5	7.5	68.0	28.0		28.0	93.0*		93.0*
Planning/Sched./Admin.	5.0		5.0	4.0		4.0	2.0		2.0	0.0		0.0**	2.0		2.0
Utility/Decontamination	69.0		69.0	0.0		0.0	0.0		0.0	5.0		5.0	0.0		0.0
Outage Planning	4.0		4.0	3.3		3.3	1.0		1.0	2.6		2.6	0.0		0.0
Plant Engineering	41.0		41.0	24.0		24.0	8.5		8.5	21.0	5.0	26.0	42.0		42.0***
Chemistry	21.0		21.0	9.5		9.5	9.0		9.0	12.0		12.0	9.0		9.0
Subtotal	356.0	0.0	356.0	177.8	0.0	177.8	129.5	7.5	137.0	116.6	5.0	121.6	201.0	0.0	201.0
TECHNICAL FUNCTIONS:															
Shift Technical Advisors	12.0		12.0	0.0		0.0	4.0		4.0	6.0		6.0	9.0		9.0
Nuclear Engineering	11.0		11.0	7.2		7.2	7.6		7.6	11.1		11.1	0.0		0.0
Mechanical Engineering	17.0		17.0	7.4		7.4	1.7		1.7	1.3		1.3	7.0		7.0
Electrical Engineering	6.5		6.5	5.2		5.2	.5		.5	1.5		1.5	7.0		7.0
Structural/Civil Engrng	0.0		0.0	3.8		3.8	.5		.5	1.0		1.0	5.0		5.0
Drafting & Design	11.5	9.0	20.5	19.4	3.5	22.9	.5		.5	.7	7.0	7.7	31.0		31.0
Project Engineering	32.0		32.0	1.0		1.0	8.0		8.0	12.0	3.0	15.0	13.0		13.0
Nuclear Fuel Management	0.0		0.0	4.1		4.1	0.0		0.0	2.0		2.0	3.0		3.0
Process Computer/Anal I&C	15.5		15.5	8.8		8.8	9.0		9.0	3.0		3.0	12.0		12.0
Start-Up & Test	12.5	3.0	15.5	0.0		0.0	0.0		0.0	1.9		1.9	0.0		0.0
Other Engineering	48.3		48.3	37.4		37.4	14.6		14.6	3.4		3.4	21.0		21.0
Licensing	10.0		10.0	7.3		7.3	1.8		1.8	3.5		3.5	5.0		5.0
System Lab.	2.5		2.5	0.0		0.0	0.0		0.0	0.0		0.0	0.0		0.0
Subtotal	178.8	12.0	190.8	101.6	3.5	105.1	48.2	0.0	48.2	47.6	10.0	57.6	113.0	0.0	113.0
NUCLEAR ASSURANCE:															
Emergency Preparedness	4.0	2.0	6.0	2.5	0.0	2.5	1.2		1.2	2.5	0.0	2.5	2.0		2.0
Quality Assurance	30.2	5.0	35.2	13.0	.5	13.5	3.6		3.6	16.5	0.0	16.5	9.6		9.6
Quality Control	15.0	0.0	15.0	13.3	0.0	13.3	4.3		4.3	12.0	0.0	12.0	6.4		6.4
Nuclear Safety Review	3.0	0.0	3.0	4.6	0.0	4.6	1.8		1.8	.5	0.0	.5	0.0		0.0***
Training & Education	36.4	7.0	38.4	19.6	0.0	19.6	20.5		20.5	23.1	3.0	26.1	18.0	3.0	21.0
Subtotal	88.6	9.0	97.6	53.0	.5	53.5	31.4	0.0	31.4	54.6	3.0	57.6	36.0	3.0	39.0

* Asm. Ops. Support radwaste
** Performed by Maint. Supv.

* 48 INP available
** Incl. 20 firefighters
*** No full-time staff.

UTILITY MANPOWER COMPARISON
BWR PLANTS - PER UNIT BASIS

	PLANT A			PLANT F			PLANT G			PLANT H			PLANT I		
	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL
PLANT DIVISION:															
Operations	74.0		74.0	47.5	3.0	50.5	62.0		62.0	75.0		75.0	45.0	0.0	45.0
Reliquate Operations	36.0		36.0	3.5	0.0	3.5	3.0		3.0*	0.0		0.0*	0.0	0.0	0.0
Maintenance:															
Correc./Prevent. Maint.	106.0		106.0	74.5	68.0	142.5	67.0	6.0	73.0	93.5		93.5	42.0	8.0	50.0
Planning/Sched./Admin.	5.0		5.0	7.0		7.0	0.0	0.0	0.0	.5		.5	0.0	0.0	0.0
Utility/Precontainuation	69.0		69.0	8.5	35.0	43.5	30.0	0.0	30.0	26.0		26.0	0.0	0.0	0.0
Outage Planning	4.0		4.0	5.0	1.5	6.5	0.0	0.0	0.0	1.5		1.5	0.0	0.0	0.0
Plant Engineering	41.0		41.0	23.5	2.0	25.5	15.0	0.0	15.0	36.0		36.0	15.0	2.0	17.0
Chemistry	21.0		21.0	6.5	4.5	11.0	8.0	0.0	8.0	12.0		12.0	7.0	0.0	7.0
Subtotal	356.0	0.0	356.0	176.0	114.0	290.0	185.0	6.0	191.0	244.5	0.0	244.5	109.0	10.0	119.0
TECHNICAL FUNCTIONS:															
Shift Technical Advisors	12.0		12.0	3.0	.5	3.5	12.0	0.0	12.0	0.0	0.0	0.0**	7.0		7.0
Nuclear Engineering	11.0		11.0	2.0	0.0	2.0	7.0	0.0	7.0	0.0	3.0	3.0	15.0		15.0
Mechanical Engineering	17.0		17.0	7.5	7.0	14.5	10.0	0.0	10.0	0.0	5.0	5.0	5.1		5.1
Electrical Engineering	6.5		6.5	7.3	.8	8.1	12.0	2.0	14.0	0.0	2.0	2.0	2.4		2.4
Structural/Civil Engrng	0.0		0.0	2.5	0.0	2.5	8.0	1.0	9.0	0.0	2.0	2.0	0.0		0.0
Drafting & Design	11.5	9.0	20.5	21.5	5.0	26.5	7.0	4.0	11.0	0.0	9.0	9.0	2.8		2.8
Project Engineering	32.0		32.0	2.0	0.0	2.0	6.0	4.0	10.0	3.5	0.0	3.5	2.0		2.0
Nuclear Fuel Management	0.0		0.0	2.5	0.0	2.5	2.0	0.0	2.0	0.0	0.0	0.0	0.0		0.0
Process Computer/Anal I&C	15.5		15.5	5.0	.5	5.5	8.0	1.0	9.0	0.0	0.0	0.0	6.0		6.0
Start-Up & Test	12.5	3.0	15.5	.5	0.0	.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Other Engineering	48.3		48.3	2.6	2.7	5.3	36.0	15.0	51.0	6.3	.5	7.0	9.3		9.3
Licensing	10.0		10.0	5.5	0.0	5.5	4.0	1.0	5.0	3.0	0.0	3.0	1.3		1.3
System Lab.	2.5		2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0
Subtotal	178.8	12.0	190.8	61.9	16.5	78.4	112.0	28.0	140.0	13.0	21.5	34.5	50.9	0.0	50.9
NUCLEAR ASSURANCE:															
Emergency Preparedness	4.0	2.0	6.0	7.5	0.0	7.5	3.0	0.0	3.0	.5	0.0	.5	2.6	0.0	2.6
Quality Assurance	30.2	5.0	35.2	20.5	0.0	20.5	16.0	0.0	16.0	5.0	0.0	5.0	7.9	1.0	8.9
Quality Control	15.0	0.0	15.0	1.1	0.0	1.1	17.0	1.0	18.0	11.5	0.0	11.5	0.0	0.0	0.0
Nuclear Safety Review	3.0	0.0	3.0	4.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Training & Education	26.4	2.0	28.4	5.0	4.0	9.0	18.0	0.0	18.0	10.0	0.0	10.0	7.0	0.0	7.0
Subtotal	88.6	9.0	97.6	33.1	4.0	37.1	54.0	1.0	55.0	27.0	0.0	27.0	17.5	1.0	18.5

* A.E.s handle reduxate

* A.E.s & Contractors handle reduxate
** Performed by Nuc Engineers

UTILITY MANPOWER COMPARISON
NUR PLANTS - PER UNIT BASIS

	PLANT A			PLANT F			PLANT G			PLANT H			PLANT I		
	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL
ADMINISTRATION:															
Budgets/Cost/Support	16.5		16.5	.5	.5	1.0	15.0	13.0	28.0	2.5		2.5	1.0		1.0
Doc. Control/Records Mgmt./Computer	20.8		20.8	18.7	4.5	23.2	26.0	8.0	36.0	3.8		3.8	4.4		4.4
Info. Mgmt/Library/ Word Processing/Clerical	11.4		11.4	6.0	1.5	7.5	0.0		0.0	3.7		3.7	8.4		8.4
Operations Analysis	3.6		3.6	0.0	0.0	0.0	0.0		0.0	0.0		0.0	0.0		0.0
Human Resources (Personnel)	16.9		16.9	5.0	0.0	5.0	0.0		0.0	3.0		3.0	1.1		1.1
Security	54.9		54.9	.8	42.5	43.3	1.0	72.0	73.0	45.0		45.0	3.8	47.0	50.8
Facility Maintenance	35.0		35.0	9.0	0.0	9.0	0.0		0.0*	0.0		0.0*	5.0		5.0
Safety & Health	5.9		5.9	3.1	0.0	3.1	0.0		0.0	.5		.5	1.5		1.5
Contracts	6.2		6.2	.3	0.0	.3	0.0		0.0	0.0		0.0	0.0		0.0
Procurement/Purchasing	4.0		4.0	.8	0.0	.8	0.0		0.0	1.0		1.0	3.0		3.0
Storeroom/Warehouse/ Materials Control	21.4		21.4	10.5	1.0	11.5	4.0		4.0	11.5		11.5	6.0		6.0
Subtotal	196.6		196.6	54.7	50.0	104.7	48.0	93.0	141.0	71.0	0.0	71.0	34.2	47.0	81.2
COMMUNICATIONS:	7.0	0.0	7.0	1.5	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
RAD. & ENV. CONTROLS:															
Environmental Controls	14.4	0.0	14.4	.8	5.3	6.1	3.0	0.0	3.0	.5	0.0	.5*	5.4	2.4	7.8
HP/Dosimetry	19.0	0.0	19.0	3.0	1.5	4.5	20.0	14.0	34.0	4.5	1.0	5.5	12.0	2.0	14.0
Radiological Controls	48.9	19.0	67.9	30.0	3.0	33.0	28.0	0.0	28.0	11.0	0.0	11.0**	3.5	0.0	3.5
Rad. Engineering/ALARA	4.0	5.0	9.0	2.0	0.0	2.0	2.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0
Subtotal	86.3	24.0	110.3	35.8	9.8	45.6	53.0	14.0	67.0	16.0	1.0	17.0	20.9	4.4	25.3
MAINTENANCE & CONSTRUCTION:															
Field Construction	28.0	25.0	45.0	43.0	7.5	50.5	0.0	0.0	0.0	.5	0.0	.5*	0.0		0.0
Technical Support	15.4	6.0	21.4	14.3	1.5	15.8	22.0	9.0	31.0	2.0	4.5	6.5	1.3		1.3
Administrative Support	14.8	0.0	14.8	6.5	.5	7.0	2.0	0.0	2.0	0.5	0.0	0.5	0.0		0.0
Subtotal	58.2	31.0	81.2	63.8	9.5	73.3	24.0	9.0	33.0	3.0	4.5	7.5	1.3	0.0	1.3
MAINT ANAVE 1ST LINE SUPV.:	90.5	0.0	90.5	4.9	0.0	4.9	50.0	0.0	50.0	20.5	0.0	20.5	23.0	0.0	23.0
GRAND TOTAL:															
A. System Total	1,054.0			431.7			526.0			395.0			256.8		
B. Contractor Total		76.0			203.8			151.0			27.0			62.4	
C. Plant Total			1,130.0			635.5			677.0			422.0			319.2

* See Utility/Decon

* Contracted

** Expect to incr. by 20 tech. in 1983

PWR PLANTS - MANPOWER COMPARISON
FUNCTION BY PLANT AND SURVEY AVERAGE

	PLANT K	PLANT L	PLANT M	PLANT N	PLANT O	PLANT P	Survey Average (Excl. TMI-1)	TMI-1
PLANT DIVISION:								
Operations	63.0	60.5	39.0	68.0	48.0	77.0	59.0	89.0
Radwaste Operations	3.0	.5	9.7	3.5	0.0	3.0	4.0	27.0
Maintenance:								
Correc./Prevent. Maint.	69.0	79.0	69.3	74.0	41.0	119.0	75.0	110.0
Planning/Sched./Admin.	4.0	2.0	5.0	12.5	1.0	8.0	5.5	10.0
Utility/Decontamination	0.0	11.5	2.7	0.0	0.0	12.0	9.0	35.0
Outage Planning	3.3	1.5	1.6	5.5	0.0	4.0	3.0	0.0
Plant Engineering	26.0	17.0	30.7	24.0	15.0	32.0	24.0	21.0
Chemistry	9.5	12.0	9.3	21.5	5.0	25.0	14.0	20.0
Subtotal	177.8	184.0	167.3	209.0	110.0	280.0	193.5	312.0
TECHNICAL FUNCTIONS:								
Shift Technical Advisors	0.0	0.0	2.3	7.0	5.0	7.0	5.5	11.0
Nuclear Engineering	7.2	3.0	7.0	3.0	14.5	20.0	9.0	5.0
Mechanical Engineering	7.4	2.0	21.8	7.0	4.7	14.0	9.5	17.0
Electrical Engineering	5.2	10.0	3.0	7.0	1.9	3.0	5.0	6.5
Structural/Civil Engrng	3.8	2.5	5.3	3.0	0.0	5.0	4.0	0.0
Drafting & Design	22.9	10.0	10.7	0.0	4.4	0.0	12.0	22.5
Project Engineering	1.0	3.0	1.5	101.0	9.0	4.0	20.0	13.0
Nuclear Fuel Management	4.1	1.0	1.9	0.0	0.0	0.0	2.5	0.0
Process Computer/Anal/I&C	8.8	8.5	3.0	14.0	6.2	3.0	7.0	12.5
Start-Up & Test	0.0	0.0	0.0	1.0	0.0	9.0	3.0	16.5
Other Engineering	37.1	35.5	23.4	57.0	12.1	36.5	33.5	46.7
Licensing	7.3	4.5	5.4	8.0	5.3	8.5	6.5	11.0
System Lab.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.5
Subtotal	104.8	80.0	85.8	208.0	63.1	110.0	119.5	164.2
NUCLEAR ASSURANCE:								
Emergency Preparedness	2.5	4.0	.5	3.0	3.6	2.0	2.5	4.0
Quality Assurance	13.5	21.0	6.5	11.0	8.9	31.0	15.5	27.3
Quality Control	15.3	17.0	11.8	14.0	3.0	12.0	12.0	15.4
Nuclear Safety Review	4.6	3.0	1.9	0.0	0.0	.5	2.5	7.0
Training & Education	19.6	15.0	15.6	31.0	14.0	31.7	21.0	42.1
Subtotal	55.5	60.0	36.3	59.0	29.5	77.2	53.5	96.8

PWR PLANTS - MANPOWER COMPARISON
FUNCTION BY PLANT AND SURVEY AVERAGE

	PLANT K	PLANT L	PLANT M	PLANT N	PLANT O	PLANT P	Survey Average (Excl. TMI-1)	TMI-1
ADMINISTRATION:								
Budgets/Cost/Support	2.0	1.7	1.9	3.0	2.0	16.5	4.5	7.5
Doc. Control/Records Mgmt./Computer	15.0	15.0	15.8	28.0	3.4	13.5	15.0	24.5
Info. Mgmt/Library/ Word Processing/Clerical	9.2	3.0	11.1	36.0	16.5	3.5	13.0	9.2
Operations Analysis	0.0	0.0	.2	0.0	0.0	0.0	0.2	2.4
Human Resources (Personnel)	0.0	8.5	4.0	3.0	6.1	5.5	5.5	11.9
Security	80.0	63.0	47.7	76.0	50.3	93.0	68.5	50.6
Facility Maintenance	15.0	23.0	36.0	33.0	9.0	15.0	22.0	28.0
Safety & Health	1.0	2.5	4.6	3.0	1.0	1.0	2.0	4.6
Contracts	0.0	0.0	2.0	4.0	0.0	0.0	3.0	6.0
Procurement/Purchasing	0.0	6.3	2.7	11.0	0.0	0.0	6.5	9.6
Storeroom/Warehouse/ Materials Control	11.5	6.5	15.7	27.0	7.0	11.0	13.0	26.0
Subtotal	133.7	129.5	141.7	224.0	95.3	159.0	153.2	180.3
COMMUNICATIONS:	0.0	1.5	0.0	1.5	0.0	1.0	1.2	12.8
RAD. & ENV. CONTROLS:								
Environmental Controls	8.2	7.7	14.9	1.0	5.3	2.5	6.5	10.5
HP/Dosimetry	6.0	11.0	10.8	11.5	2.0	27.0	11.5	10.5
Radiological Controls	22.9	13.0	15.9	21.5	20.5	15.5	18.0	43.8
Rad. Engineering/ALARA	1.5	.5	2.5	2.0	0.0	1.0	1.5	10.0
Subtotal	38.6	32.2	44.1	36.0	28.0	46.0	37.5	82.8
MAINTENANCE & CONSTRUCTION:								
Field Construction	0.0	43.5	176.3	104.0	0.0	0.0	108.0	24.0
Technical Support	5.4	11.0	12.7	6.0	.3	13.0	8.9	21.6
Administrative Support	4.6	0.0	4.0	0.0	1.0	0.0	3.2	6.2
Subtotal	10.0	54.5	193.0	110.0	1.3	13.0	119.2	51.8
MGMT ABOVE 1ST LINE SUPV.:	19.0	14.0	28.8	32.0	11.0	33.5	23.8	74.5
GRAND TOTAL:	537.4	555.7	697.0	879.0	338.2	719.7	700.6	975.0

UTILITY MANPOWER COMPARISON
PWR PLANTS - PER UNIT BASIS

	PLANT J			PLANT K			PLANT L			PLANT M		
	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL
PLANT DIVISION:												
Operations	89.0		89.0	63.0		63.0	60.5		60.5	39.0		39.0
Radwaste Operations	27.0		27.0	3.0		3.0	.5		.5*	9.7		9.7
Maintenance:												
Correc./Prevent. Maint.	105.0	5.0	110.0	69.0		69.0	78.0	1.0	79.0	69.3		69.3*
Planning/Sched./Admin.	10.0		10.0	4.0		4.0	2.0		2.0	5.0		5.0
Utility/Decontamination	35.0		35.0	0.0		0.0	8.0	3.5	11.5	2.7		2.7**
Outage Planning	0.0		0.0	3.3		3.3	1.5		1.5	1.3	.3	1.6
Plant Engineering	21.0		21.0	26.0		26.0	17.0		17.0	30.7		30.7
Chemistry	20.0		20.0	9.5		9.5	10.0	2.0	12.0	9.3		9.3
Subtotal	307.0	5.0	312.0	177.8	0.0	177.8	177.5	6.5	184.0	167.0	.3	167.3
TECHNICAL FUNCTIONS:												
Shift Technical Advisors	11.0		11.0	0.0		0.0	0.0	0.0	0.0	2.3		2.3
Nuclear Engineering	5.0		5.0	7.2		7.2	1.0	2.0	3.0	7.0		7.0
Mechanical Engineering	17.0		17.0	7.4		7.4	0.0	2.0	2.0	21.8		21.8
Electrical Engineering	6.5		6.5	5.2		5.2	5.0	5.0	10.0	3.0		3.0
Structural/Civil Engrng	0.0		0.0	3.8		3.8	0.0	2.5	2.5	5.8		5.8
Drafting & Design	13.5	9.0	22.5	19.4	3.5	22.9	5.0	5.0	10.0	10.7		10.7
Project Engineering	13.0		13.0	1.0		1.0	3.0	0.0	3.0	1.5		1.5
Nuclear Fuel Management	0.0		0.0	4.1		4.1	1.0	0.0	1.0	1.9		1.9
Process Computer/Anal/I&C	12.5		12.5	8.8		8.8	5.5	3.0	8.5	3.0		3.0
Start-Up & Test	13.5	3.0	16.5	0.0		0.0	0.0	0.0	0.0	0.0		0.0
Other Engineering	46.7		46.7	37.1		37.1	15.0	20.5	35.5	23.4		23.4
Licensing	11.0		11.0	7.3		7.3	4.5	0.0	4.5	5.4		5.4
System Lab.	2.5		2.5	0.0		0.0	0.0	0.0	0.0	0.0		0.0
Subtotal	152.2	12.0	164.2	101.3	3.5	104.8	40.0	40.0	80.0	85.8	0.0	85.8
NUCLEAR ASSURANCE:												
Emergency Preparedness	3.8	1.0	4.8	2.5	0.0	2.5	4.0	0.0	4.0	.5		.5
Quality Assurance	25.3	2.0	27.3	13.0	.5	13.5	14.5	6.5	21.0	6.5		6.5
Quality Control	15.4	0.0	15.4	13.3	0.0	13.3	17.0	0.0	17.0	11.8		11.8
Nuclear Safety Review	7.0	0.0	7.0	4.6	0.0	4.6	3.0	0.0	3.0	1.9		1.9
Training & Education	42.1	0.0	42.1	19.6	0.0	19.6	14.0	1.0	15.0	15.6		15.6
Subtotal	93.6	3.0	96.6	53.0	.5	53.5	52.5	7.5	60.0	36.3	0.0	36.3

* Performed by shift Op. personnel; handling/shipping by HP personnel.

* INF of approx. 70 skilled workers avail.

** Assisted by Fac. Maint. Staff for decon work.

UTILITY MANPOWER COMPARISON
PWR PLANTS - PER UNIT BASIS

	PLANT J			PLANT K			PLANT L			PLANT M		
	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL
ADMINISTRATION:												
Budgets/Cost/Support	7.5		7.5	2.0		2.0	1.7		1.7	1.9		1.9
Doc. Control/Records Mgmt./Computer	24.5		24.5	13.2	1.8	15.0	15.0		15.0	15.8		15.8
Info. Mgmt/Library/ Word Processing/Clerical	9.2		9.2	9.2		9.2	3.0		3.0	11.1		11.1
Operations Analysis	2.4		2.4	0.0		0.0	0.0		0.0	.2		.2
Human Resources (Personnel)	11.9		11.9	0.0		0.0	8.5		8.5	4.0		4.0
Security	50.6		50.6	5.0	75.0	80.0	43.5	19.5	63.0	3.7	44.0	47.7
Facility Maintenance	28.0		28.0	15.0		15.0	23.0		23.0	0.0	36.0	36.0
Safety & Health	4.6		4.6	1.0		1.0	2.5		2.5	4.6		4.6
Contracts	6.0		6.0	0.0		0.0	0.0		0.0	2.0		2.0
Procurement/Purchasing	9.6		9.6	0.0		0.0	6.3		6.3	2.7		2.7*
Storeroom/Warehouse/ Materials Control	26.0		26.0	11.5		11.5	6.5		6.5	15.7		15.7
Subtotal	180.3	0.0	180.3	56.9	76.8	133.7	110.0	19.5	129.5	61.7	80.0	141.7
COMMUNICATIONS:	12.8	0.0	12.8	0.0	0.0	0.0	1.5	0.0	1.5	0.0	0.0	0.0
RAD. & ENV. CONTROLS:												
Environmental Controls	10.5	0.0	10.5	8.2		8.2	1.7	6.0	7.7	14.9		14.9
HP/Dosimetry	17.0	1.5	18.5	6.0		6.0	10.5	.5	11.0	10.8		10.8
Radiological Controls	43.8	0.0	43.8	22.9		22.9	10.0	3.0	13.0	15.9		15.9
Rad. Engineering/ALARA	10.0	0.0	10.0	1.5		1.5	.5	0.0	.5	2.5		2.5
Subtotal	81.3	1.5	82.8	38.6	0.0	38.6	22.7	9.5	32.2	44.1	0.0	44.1
MAINTENANCE & CONSTRUCTION:												
Field Construction	4.0	20.0	24.0	0.0		0.0	43.5		43.5	176.3		176.3
Technical Support	16.6	5.0	21.6	5.4		5.4	11.0		11.0	12.7		12.7
Administrative Support	6.2	0.0	6.2	4.6		4.6	0.0		0.0	4.0		4.0
Subtotal	26.8	25.0	51.8	10.0	0.0	10.0	54.5	0.0	54.5	193.0	0.0	193.0
MGMT ABOVE 1ST LINE SUPV.:	74.5	0.0	74.5	19.0	0.0	19.0	14.0	0.0	14.0	28.8	0.0	28.8
GRAND TOTAL:												
A. System Total	928.5			456.6			472.7			616.7		
B. Contractor Total		46.5			80.8			83.0			80.3	
C. Plant Total			975.0			537.4			555.2			697.0

* All procurement handled through a company owned subsidiary.

UTILITY MANPOWER COMPARISON
PWR PLANTS - PER UNIT BASIS

	PLANT J			PLANT N			PLANT O			PLANT P		
	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL
PLANT DIVISION:												
Operations	89.0		89.0	68.0		68.0	48.0		48.0	77.0		77.0
Radwaste Operations	27.0		27.0	1.5	2.0	3.5	0.0		0.0	3.0		3.0
Maintenance:												
Correc./Prevent. Maint.	105.0	5.0	110.0	74.0		74.0	36.0	5.0	41.0	119.0		119.0
Planning/Sched./Admin.	10.0		10.0	10.5	2.0	12.5	1.0		1.0	8.0		8.0
Utility/Decontamination	35.0		35.0	0.0		0.0	9.0		0.0	12.0		12.0
Outage Planning	0.0		0.0	5.5		5.5	0.0		0.0	4.0		4.0
Plant Engineering	21.0		21.0	21.0	3.0	24.0	15.0		15.0	32.0		32.0
Chemistry	20.0		20.0	21.5		21.5	5.0		5.0	25.0		25.0
Subtotal	307.0	5.0	312.0	202.0	7.0	209.0	105.0	5.0	110.0	280.0	0.0	280.0
TECHNICAL FUNCTIONS:												
Shift Technical Advisors	11.0		11.0	7.0	0.0	7.0	5.0		5.0	7.0		7.0
Nuclear Engineering	5.0		5.0	3.0	0.0	3.0	14.5		14.5	20.0		20.0
Mechanical Engineering	17.0		17.0	5.0	2.0	7.0	4.7		4.7	14.0		14.0
Electrical Engineering	6.5		6.5	5.0	2.0	7.0	1.9		1.9	3.0		3.0
Structural/Civil Engrng	0.0		0.0	3.0	0.0	3.0	0.0		0.0	5.0		5.0
Drafting & Design	13.5	9.0	22.5	0.0	0.0	0.0*	4.4		4.4	0.0		0.0
Project Engineering	13.0		13.0	1.0	100.0	101.0	9.0		9.0	4.0		4.0
Nuclear Fuel Management	0.0		0.0	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Process Computer/Anal/ISC	12.5		12.5	13.0	1.0	14.0	6.2		6.2	3.0		3.0
Start-Up & Test	13.5	3.0	16.5	1.0	0.0	1.0	0.0		0.0	9.0		9.0
Other Engineering	46.7		46.7	16.0	41.0	57.0	12.1		12.1	36.5		36.5
Licensing	11.0		11.0	6.0	2.0	8.0	5.3		5.3	8.5		8.5
System Lab.	2.5		2.5	0.0	0.0	0.0	0.0		0.0	0.0		0.0
Subtotal	152.2	12.0	164.2	60.0	148.0	208.0	63.1	0.0	63.1	110.0	0.0	110.0
NUCLEAR ASSURANCE:												
Emergency Preparedness	3.8	2.0	4.8	3.0	0.0	3.0	3.6		3.6	2.0		2.0
Quality Assurance	25.3	2.0	27.3	11.0	0.0	11.0	8.9		8.9	31.0		31.0
Quality Control	15.4	0.0	15.4	14.0	0.0	14.0	3.0		3.0	12.0		12.0
Nuclear Safety Review	7.0	0.0	7.0	0.0	0.0	0.0**	0.0		0.0	.5		.5
Training & Education	42.1	2.0	42.1	25.0	6.0	31.0	14.0		14.0	31.7		31.7
Subtotal	93.6	3.0	96.6	53.0	6.0	59.0	29.5	0.0	29.5	77.1	0.0	77.2

* Drafting done by A/E

** Review Committee comprised of 14 P-T members.

UTILITY MANPOWER COMPARISON
PWR PLANTS - PER UNIT BASIS

	PLANT J			PLANT N			PLANT O			PLANT P		
	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL	SYS	CONT	TOTAL
ADMINISTRATION:												
Budgets/Cost/Support	7.5		7.5	3.0		3.0	2.0		2.0	16.5		16.5
Doc. Control/Records Mgmt./Computer	24.5		24.5	23.0	5.0	28.0	3.4		3.4	13.5		13.5
Info. Mgmt/Library/ Word Processing/Clerical	9.2		9.2	18.0	18.0	36.0	16.5		16.5	3.5		3.5
Operations Analysis	2.4		2.4	0.0		0.0	0.0		0.0	0.0		0.0
Human Resources (Personnel)	11.9		11.9	3.0		3.0	6.1		6.1	5.5		5.5
Security	50.6		50.6	2.0	74.0	76.0	2.3	48.0	50.3	20.0	73.0	93.0
Facility Maintenance	28.0		28.0	33.0		33.0	9.0		9.0	15.0		15.0
Safety & Health	4.6		4.6	3.0		3.0	1.0		1.0	1.0		1.0
Contracts	6.0		6.0	4.0		4.0	0.0		0.0	0.0		0.0
Procurement/Purchasing	9.6		9.6	11.0		11.0	0.0		0.0	0.0		0.0
Storeroom/Warehouse/ Materials Control	26.0		26.0	27.0		27.0	7.0		7.0	11.0		11.0
Subtotal	180.3	0.0	180.3	127.0	97.0	224.0	47.3	48.0	95.3	86.0	73.0	159.0
COMMUNICATIONS:	12.8	0.0	12.8	1.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	1.0
RAD. & ENV. CONTROLS:												
Environmental Controls	10.5	0.0	10.5	1.0		1.0	5.1	.4	5.5	2.5		2.5
HP/Dosimetry	17.0	1.5	18.5	6.5	5.0	11.5	2.0	0.0	2.0	27.0		27.0
Radiological Controls	43.8	0.0	43.8	21.5		21.5	20.5	0.0	20.5	15.5		15.5
Rad. Engineering/ALARA	10.0	0.0	10.0	2.0		2.0	0.0	0.0	0.0	1.0		1.0
Subtotal	81.3	1.5	82.8	31.0	5.0	36.0	27.6	.4	28.0	46.0	0.0	46.0
MAINTENANCE & CONSTRUCTION:												
Field Construction	4.0	20.0	24.0	0.0	104.0	104.0	0.0		0.0	0.0		0.0
Technical Support	16.6	5.0	21.6	6.0	0.0	6.0	.3		.3	13.0		13.0
Administrative Support	6.2	0.0	6.2	0.0	0.0	0.0	1.0		1.0	0.0		0.0
Subtotal	26.8	25.0	51.8	6.0	104.0	110.0	1.3	0.0	1.3	13.0	0.0	13.0
MAINT ANNUAL 1ST LINE SUPV.:	74.5	0.0	74.5	32.0	0.0	32.0	11.0	0.0	11.0	33.5	0.0	33.5
GRAND TOTAL:												
A. System Total	928.5			512.0			284.8			646.7		
B. Contractor Total		46.5			367.0			53.4			73.0	
C. Plant Total			975.0			879.0			338.2			719.7

E. COST ANALYSIS RESULTS

The tables and charts included at the end of this section were prepared and furnished by GPUN, and reflect the summation of data collected from the various utilities. The validity of the data suffers from many of the same problems identified with the manpower data, particularly with respect to capital expenditures and the individual utility's breakdown between capital and O&M expenses. Because of the questionable accuracy of the cost data, BETA concludes that any comparative analysis would be of limited value. However, from this data a number of conclusions can be reached.

1. The degree of imbalance between GPUN and the other utilities is less pronounced in terms of cost than in terms of manpower. For example, in the case where GPUN shows a manpower ratio between themselves and the lowest reporting of 3.54, the cost ratio between these same plants is only 2.1 (1981 figures). This could be because there is a tendency for the cost data to be more accurate than the manning data. Also, the cost data reflects historical information whereas manpower data is probably a mixture of historical and projected information. Probably the most significant rationalization for this difference is that manning figures do not include contractors to the same extent as the cost figures do. Where a utility goes out and hires an engineering firm to perform a task under a capital project, the people used are not reported in the manpower data. Since each utility uses various amounts of contracted work, the reported manpower figures could easily be off by a significant factor.

2. Nuclear fuel costs are not included within the total cost data. If all utilities used the same criteria for arriving at fuel costs then the absence of this number would not affect the overall meaning of the cost data. However, based on BETA's knowledge, what a given utility allows to be put in that cost center varies considerably. Even in the case of GPUN some costs associated with nuclear fuel management are not chargeable to GPUN. A review of the annual FERC reports on nuclear fuel charges shows extremely wide variations from utility to utility.

3. Discounting the absolute numbers, it can be seen that there is a substantial step increase in expenditures in all plants in the years following the accident at TMI. (See charts at the end of this section). It is suspected that 1982 cost data will show all the plants tending to reach about the same levels, as those plants, which were lagging in accomplishing the TMI lessons learned modifications, start to catch up.

4. An analysis of the cost of capital projects provides no useful means of comparison. BETA had anticipated that looking at the return costs to do a similar modification at several different plants might provide an insight to efficiency. Due to a number of reasons this did not prove to be the case.

In summary, it would appear that gross cost comparative data tends to be more meaningful than manning data. Recognizing there are inaccuracies

in the cost data, it is still possible to watch the trends. For this reason it is recommended that GPUN continue to obtain cost data from the other utilities to see if the other plants do, in fact, start to come closer together. Although doing this might prove to be interesting, it will not point to any specific area within GPUN as being out of line.

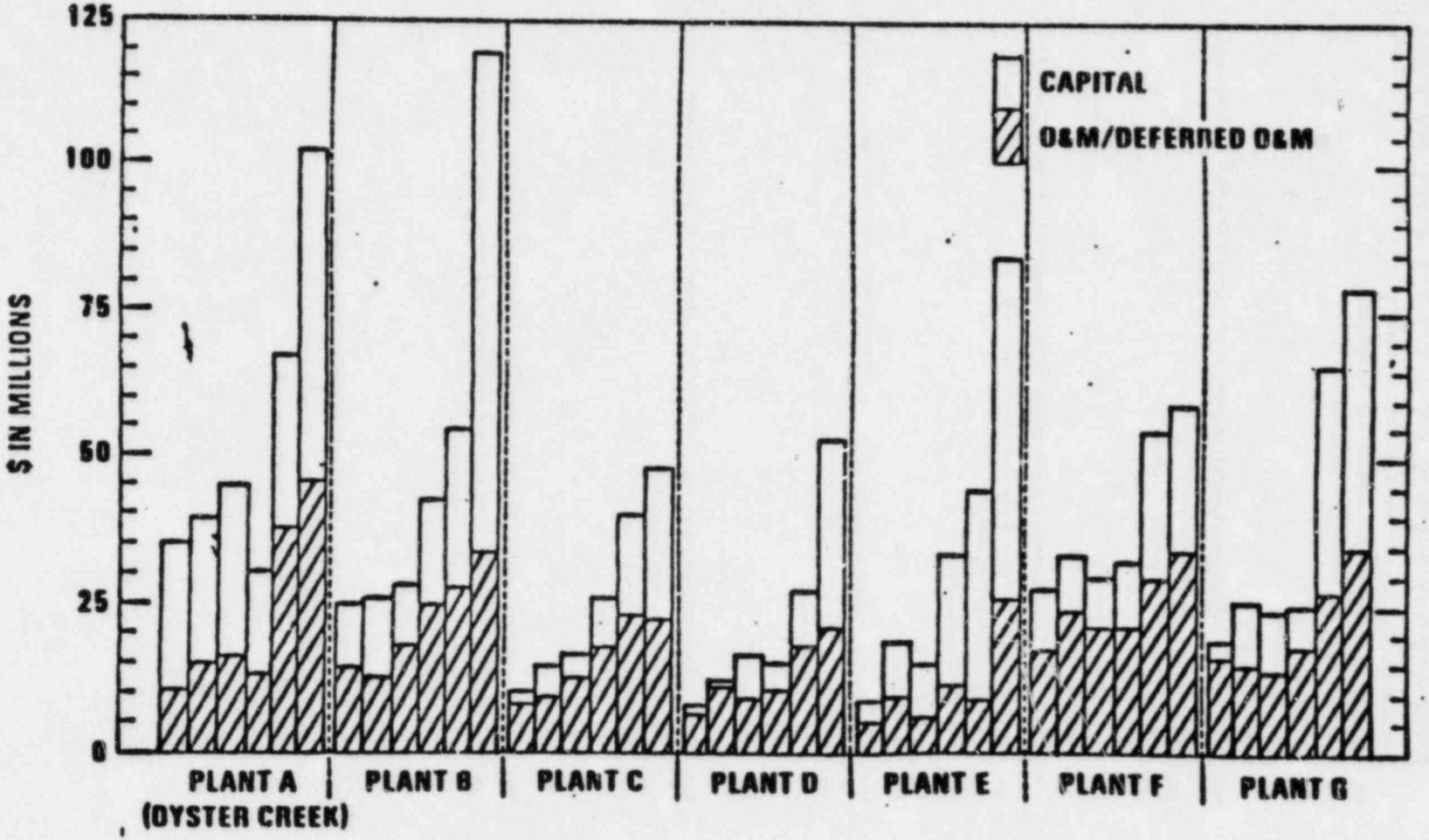
INDUSTRY SURVEY COST COMPARISON
HISTORICAL COSTS - PER UNIT BASIS
($ IN MILLIONS)

BWR PLANTS

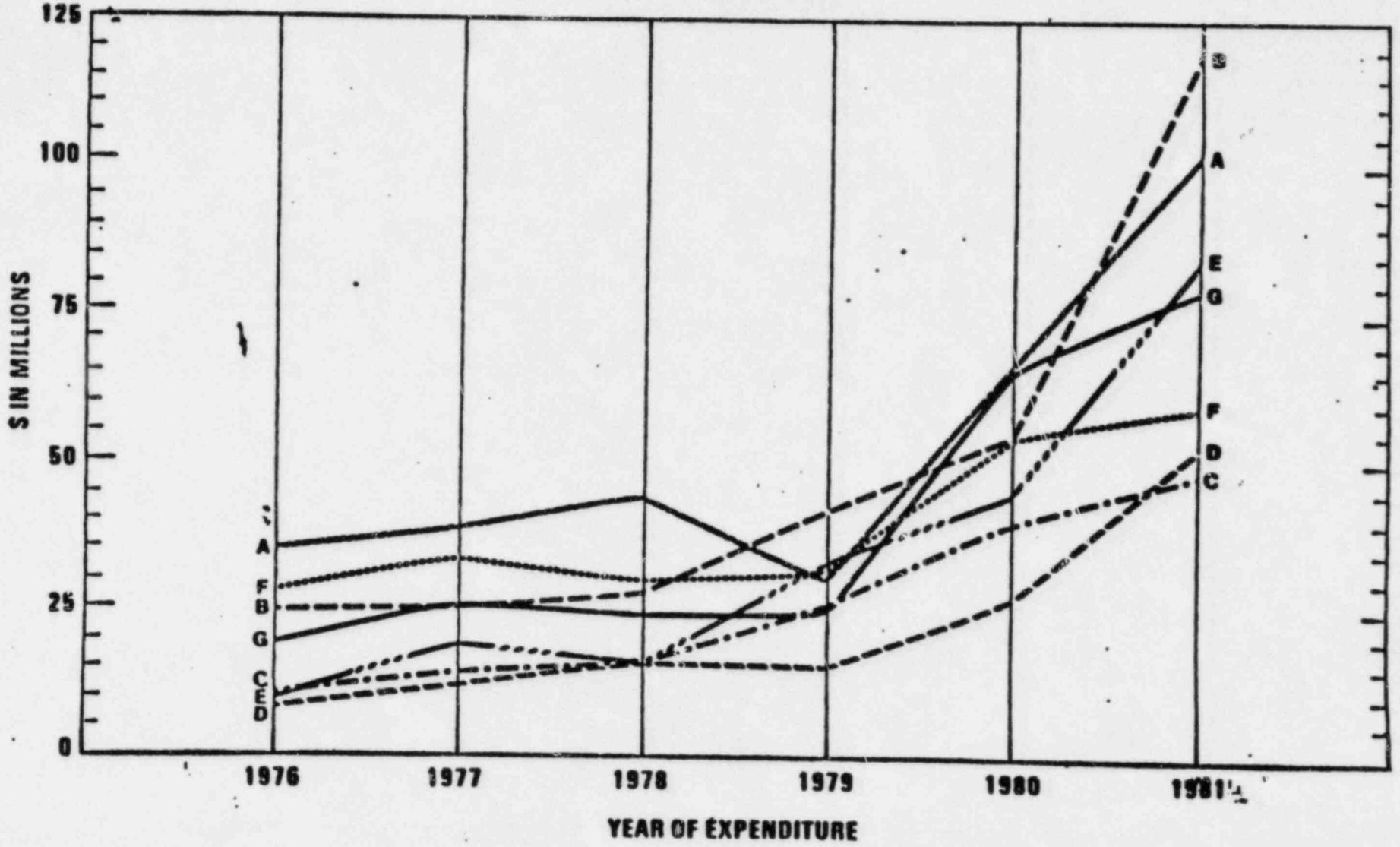
		PLANT A	PLANT B	PLANT C	PLANT D	PLANT E	PLANT F	PLANT G
1976:	O&M	10.4	14.0	8.1	6.6	5.3	14.0	16.6
	Capital	25.0	10.7	1.8*	1.3*	4.1	10.0	2.5*
	Nuclear G&A	-	-	-	-	-	4.0	-
		$ 35.4	$24.7	$ 9.9	$ 7.9	$ 9.4	$28.0	$19.1
	Capacity Factor	67.6	65.6	55.6	83.3	76.8	42.0	42.0
1977:	O&M	14.8	12.6	8.4	11.1	9.7	21.8	15.3
	Capital	24.0	12.7	5.2*	1.1*	9.6	9.1	10.6*
	Nuclear G&A	-	-	.7	-	-	2.7	-
		$ 38.8	$25.3	$14.3	$12.2	$19.3	$33.6	$25.9
	Capacity Factor	57.0	83.4	57.1	74.8	55.1	47.2	46.2
1978:	O&M	15.9	17.9	11.1	9.1	6.4	19.7	14.2
	Capital	28.2	10.0	3.9*	7.1	9.1	8.1	10.2*
	Nuclear G&A	-	-	1.4	-	-	2.1	-
		$ 44.1	$27.9	$16.4	$16.2	$15.5	$29.9	$24.4
	Capacity Factor	64.0	80.5	66.2	80.8	82.3	73.3	76.3
1979:	O&M	13.0	24.6	15.6	10.6	11.7	20.0	18.4
	Capital	17.3	17.5	8.2*	4.7	21.9	10.8	6.4*
	Nuclear G&A	-	-	2.2	-	-	1.8	-
		$ 30.3	$42.1	$26.0	$15.3	$33.6	$32.6	$24.8
	Capacity Factor	80.1	73.0	63.4	92.2	55.3	78.6	84.4
1980:	O&M	37.5	27.6	19.3	18.4	9.4	28.4	27.8
	Capital	29.2	22.6	16.5*	8.9	35.4	24.3	38.1*
	Nuclear G&A	-	-	4.0	-	-	1.9	-
	Deferrals	-	4.0	-	-	-	-	-
		$ 66.7	$54.2	$39.8	$27.3	$44.5	$54.6	$65.9
	Capacity Factor	34.4	58.6	51.0	72.3	83.6	62.0	53.1
1981:	O&M	$ 45.2	33.5	18.6	21.3	26.7	32.7	35.0
	Capital	56.8	85.3	24.7*	31.3	57.5	24.9	44.1*
	Nuclear G&A	-	-	4.4	-	-	1.6	-
	Deferrals	-	11.0	-	-	-	-	-
		$102.0	$118.8	$47.7	$52.6	$84.2	$59.2	$79.1
	Capacity Factor	46.2	43.6	68.7	68.2	60.2	52.3	60.0
	Plant Vintage	>10 Yrs	>10 Yrs	>10 Yrs	>10 Yrs	>10 Yrs	5-10 Yrs	5-10 Yrs

* Capital expenditures were not available. One half of prior year and one half of current year capital additions to plant-in-service were used as a substitute.

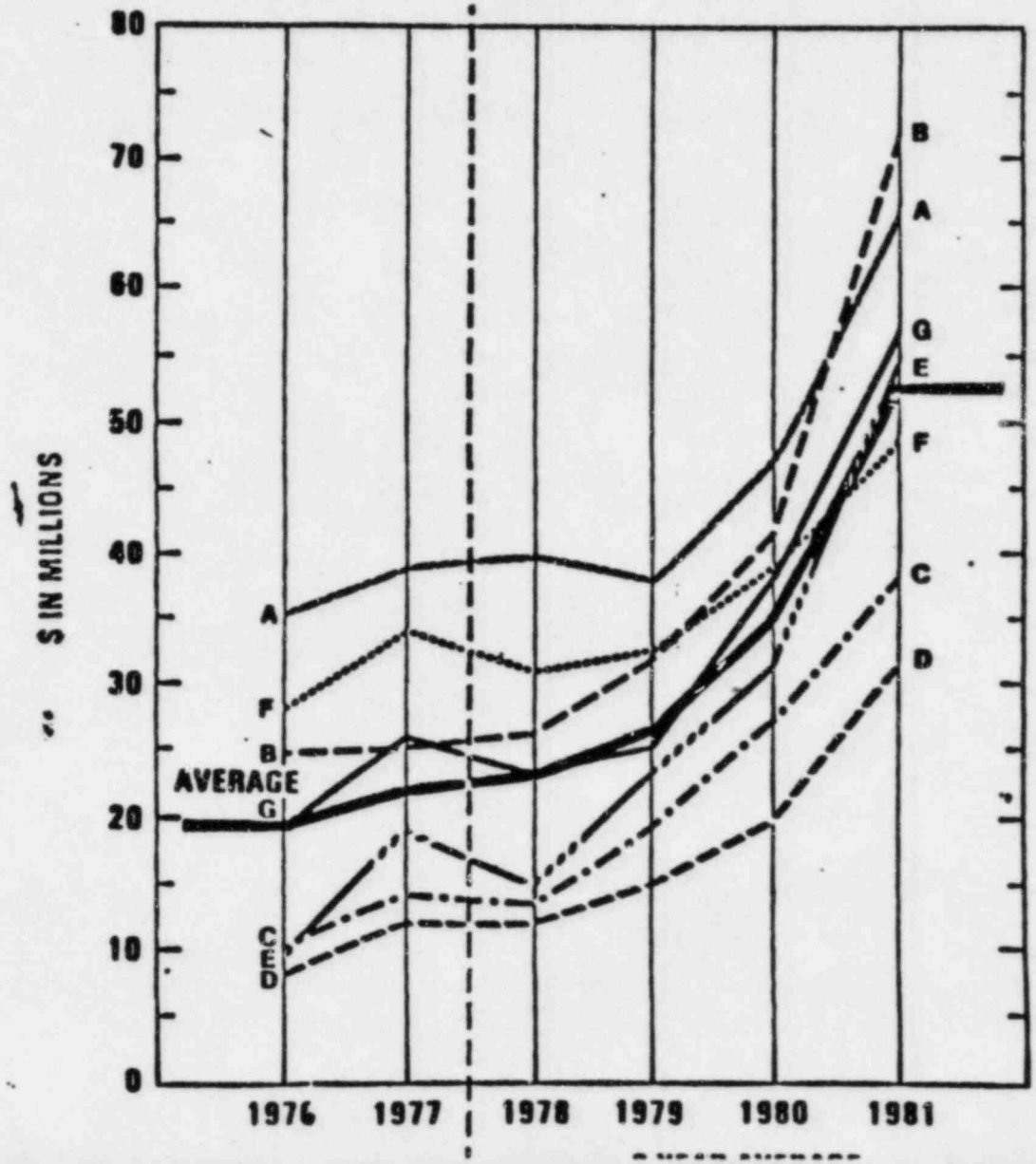
BWR Historical Cost Comparison
1976 - 1981



BWR Plants - Historical Costs per Unit Basis



BWR Historical Cost Comparison
1976 - 1981



INDUSTRY SURVEY COST COMPARISON — PWR PLANTS

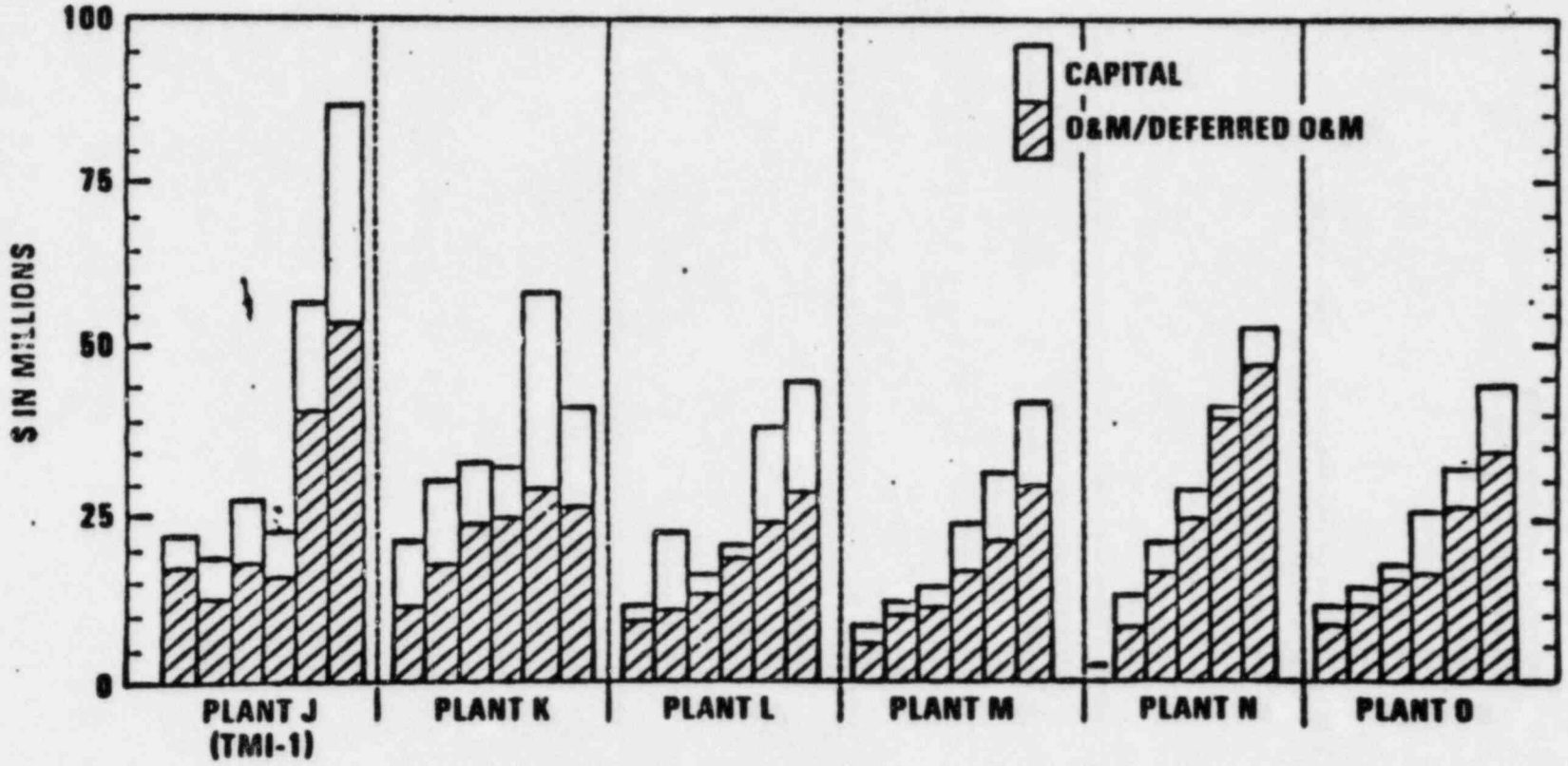
HISTORICAL COSTS - PER UNIT BASIS

($IN MILLIONS)

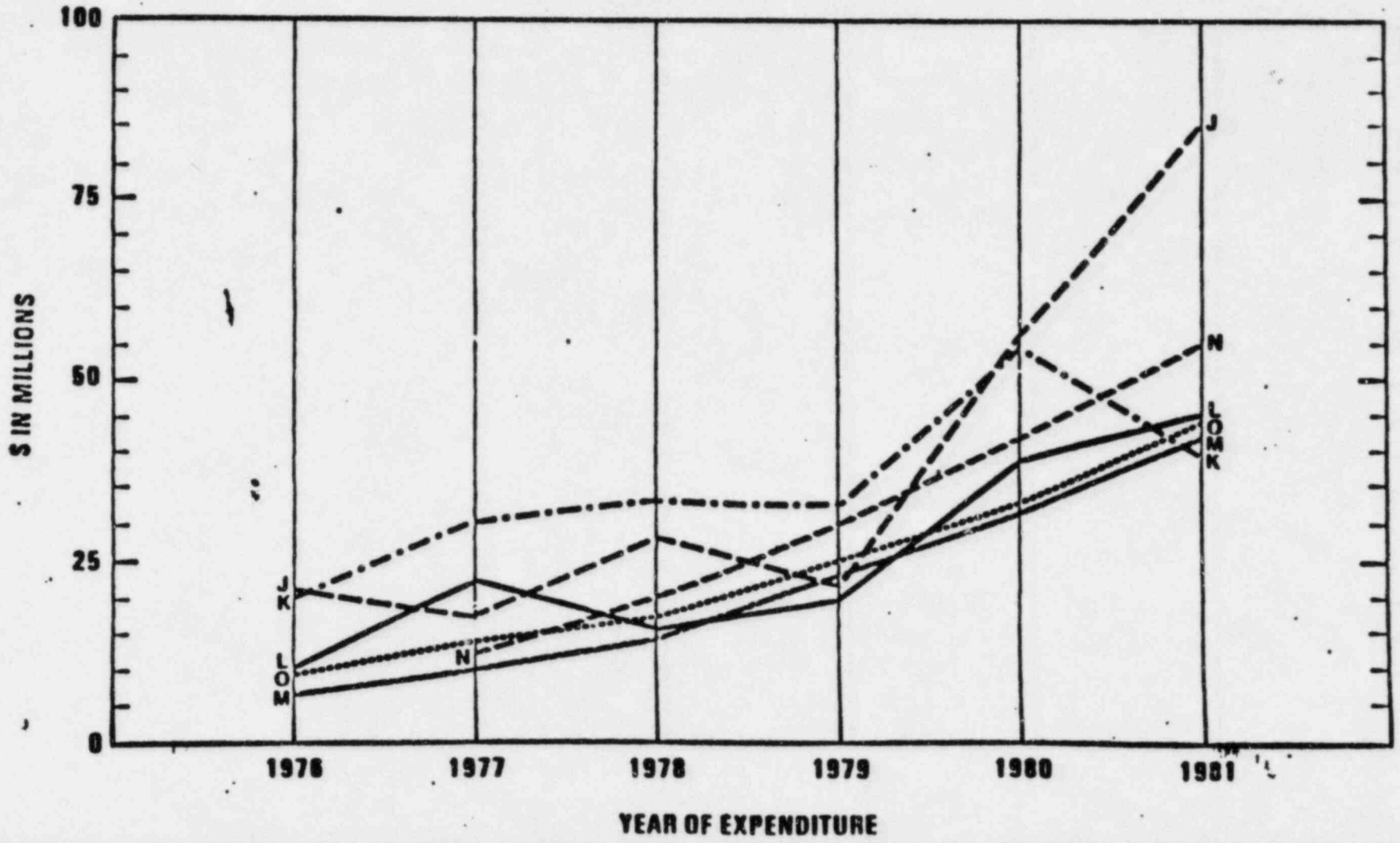
		PLANT J	PLANT K	PLANT L	PLANT M	PLANT N	PLANT O
1976:	O&M	17.8	10.9	9.1	5.6	-	5.3
	Capital	4.5	10.7	1.9*	1.9	-	2.0
	Nuclear G&A	-	-	-	.6	-	3.1
		$22.3	$21.6	$11.0	$ 8.1	-0-	$10.4
	Capacity Factor	60.3	62.5	84.9	55.6	N/A	85.4
1977:	O&M	13.3	17.4	10.1	8.3	8.4	8.4
	Capital	4.9	12.7	13.4	2.2	4.5*	2.4
	Nuclear G&A	-	-	-	1.1	-	3.5
		$18.2	$30.1	$23.5	$11.6	$12.9	$14.3
	Capacity Factor	76.2	59.7	73.7	55.8	69.4	74.3
1978:	O&M	18.0	23.7	13.0	9.9	15.6	10.8
	Capital	9.0	10.0	3.2	2.6	4.5*	2.1
	Nuclear G&A	-	-	-	1.6	-	4.4
		$27.0	$33.7	$16.2	$14.1	$20.1	$17.3
	Capacity Factor	79.1	61.9	66.9	68.2	35.9	76.2
1979:	O&M	16.3	24.1	18.2	13.4	24.0	10.0
	Capital	6.8	7.9	2.9	7.4	4.1	8.5
	Nuclear G&A	-	-	-	2.9	-	6.8
		$23.1	$32.0	$21.1	$23.7	$28.1	$25.3
	Capacity Factor	11.8	58.6	65.4	61.0	52.1	62.8
1980:	O&M	40.7	28.6	20.8	17.3	39.8	14.0
	Capital	16.1	25.8	15.3	11.7	1.9	7.8
	Nuclear G&A	-	-	-	3.3	-	8.7
	Deferrals	-	-	2.5	-	-	3.0
		$56.8	$54.4	$38.6	$32.3	$41.7	$33.5
	Capacity Factor	N/A	64.1	80.8	62.7	46.4	60.9
1981:	O&M	54.0	25.4	25.1	19.6	47.0	20.6
	Capital	32.7	14.3	17.7	14.0	5.6	10.1
	Nuclear G&A	-	-	-	8.7	-	10.7
	Deferrals	-	-	2.5	-	-	3.0
		$86.7	$39.7	$45.3	$42.3	$52.6	$44.4
	Capacity Factor	N/A	79.9	77.8	59.3	56.5	72.1
	Plant Vintage	5-10 Yrs	5-10 Yrs	5-10 Yrs	5-10 Yrs	5-10 Yrs	5-10 Yrs

* Capital expenditures were not available. One half of prior year and one half of current year capital additions to plant-in-service were used as a substitute.
N/A = Not Applicable

PWR Historical Cost Comparison
1976 - 1981



PWR Plants - Historical Costs per Unit Basis



PWR Historical Cost Comparison
1976 - 1981