TECHNICAL LETTER REPORT

SITE SURVEY OF RANCHO SECO

MAINTENANCE PROGRAM AND PRACTICES

FIN B2984

January 3 (89)

## EXECUTIVE SUMMARY

As part of the U. S. Nuclear Regulatory Commission's (NRC) Maintenance and Surveillance Program's Survey and Evaluation of Maintenance Effectiveness Project, a site survey was conducted at the Rancho Seco Nuclear Power Plant. The purpose of the visit was to collect descriptive data and observations about Rancho Seco's maintenance and surveillance program, using a data-gathering protocol developed for this project. The site survey was conducted the week of September 30, 1985, with a team of three NRC and two Pacific Northwest Laboratory (PNL) staff.

Protocol information was collected in five main areas: organization and administration; facilities and equipment; technical procedures; personnel; and work control. The protocol includes the detailed information, while this report contains selected observations and summaries extracted from that protocol.

Organization and Administration. The Rancho Seco plant's Maintenance Department is in the middle of a significant change in size, structure, and operating philosophy. The maintenance staff size has almost tripled over the past five years, but the organizational structure had not changed in order to keep up with the increase. While a formal job/task analyses on new and some existing jobs is being conducted, other aspects of the maintenance program are not being treated in the same systematized manner. Preventive, corrective, and predictive maintenance are not defined in plant policies and procedures; and specific goals and objectives for maintenance had not been set in the past. Recently, the Nuclear Utilities Management and Human Resources Committee (NUMARC) indicators were adopted for use in tracking maintenance performance.

The plant has no formal equipment trending system (one is to be implemented next year), no formal root cause analysis program (one is in the process of being implemented and should be completed next year), no method for tracking long lead time spares, and no method for integrating surveillance tests, preventive maintenance, and corrective maintenance.

Inadequate supervision and poor communications in some areas have recently been recognized as problems. Formal policies on how much time a supervisor should spend out in the field have been implemented, and the communication problems are being addressed through training, requiring design engineers to spend more time in the plant, and implementing a liaison position for interface between plant staff and contractor design engineers.

Facilities and Equipment. Maintenance workshop, spare parts storage, and tool storage appear to be adequate, though requirements were not determined through an initial formal analysis. At this time, contaminated

item storage represents the only space problem. Maintenance is delayed on the average of about once per week due to the unavailability of spare parts. This problem is related to the lack of an automated inventory control system.

Technical Procedures. Maintenance procedures for use by craftsmen while doing maintenance work were not developed, controlled, and updated using a formal program in the past. The plant is now moving to a more formal approach for procedure development. QC hold points are set by engineering staff in the maintenance work groups. The QC Department reviews QC hold points that are in the maintenance procedures, but QC is not required by Administrative Procedure to review QC hold points placed by the engineering staff in the Work Order.

Personnel. Staffing considerations were made in a reactive manner in the past, i.e., no staffing level planning was done and hires were made in an attempt to catch up with an increasing work load and Work Request backlog. The Maintenance Department management and supervisory staff feel that the present staffing levels are too low and that too much of the maintenance work is being done by contractors. Thus, Rancho Seco has recently carried out a staffing needs assessment and determined what job functions should be moved from contractor to Rancho Seco staff. Hiring is to take place next year to carry out the staff expansion.

Maintenance training has been very limited. Two years ago, the Training Department decided to obtain Institute of Nuclear Power Operations (INPO) accreditation and therefore began using a systematic approach to training development. The benefits of this approach are not expected to be felt until next year.

Work Control. Work control and the planning/scheduling system have been inefficient. Currently, most of the planning and scheduling is carried out by the light Foremen. These paperwork requirements, involving the Work Request, have kept the light Foremen from performing needed supervision. Next year a specific Scheduling Department is to be added to handle the scheduling function. In addition, a planning position is to be added to each of the three maintenance work groups.

The role of Quality Control (QC) regarding maintenance at Rancho Seco does not include certain responsibilities. For example, QC hold points are not set by QC staff, QC is not carried out on non-safety-related equipment, QC does not carry out random inspections, and QC is typically given little to no forewarning about the need for a QC inspection.

In summary, until this year Rancho Seco's maintenance program was not based on a systematic approach to maintenance. As a result of recent maintenance initiatives, there are now elements of such an approach, especially in the training and staffing areas. The implementation of these and other modifications is currently ongoing and in various stages of completion. It is therefore too early for a survey team or the facility to determine how effective these changes will be.

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U.S. NUCLEAR REGULATORY COMMISSION
DIVISION OF HUMAN FACTORS TECHNOLOGY (DHFT)

RANCHO SECO NUCLEAR POWER PLANT
SITE SURVEY REPORT

## A. GENERAL INFORMATION:

Docket No.: 50-312 License No.: DPR-54

Licensee: Sacramento Municipal Utility District
6201 S Street
P. O. Box 15830
Sacramento, CA 95852-1830

Survey Conducted: September 30 through October 4, 1985

Team Members: N. B. (Tommy) Le, NRR, Team Leader
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## B. SURVEY METHODOLOGY:

The NRC has undertaken a program to investigate, and, if necessary, instigate measures to improve maintenance in the U.S. nuclear power industry. A multi-year Maintenance and Surveillance Program Plan (MSPP) (SECY 85-129) has been prepared to document this program. The MSPP has two purposes: (1) Provide direction for NRC efforts to ensure effective maintenance and surveillance and (2) Propose alternate regulatory approaches with respect to maintenance and surveillance activities, if necessary. The MSPP identifies the technical and regulatory issues to be addressed and directs the integration and planning of NRC's activities to accomplish these objectives.

Phase I of this effort is entitled "Survey and Evaluation of Maintenance Effectiveness." A major objective of this project is to obtain information and assess the current practices of nuclear power plant maintenance and surveillance programs in five broad categories:

- organization and administration
- facilities and equipment
- technical procedures
- personnel
- work control

Observations by individuals interviewed during the site visit are noted as such; where differing opinions or descriptive facts and figures were given, efforts were made to confirm or verify that information through other sources.

The attached appendixes contain a list of Rancho Seco staff who were interviewed, a list of the people who attended the entrance and exit meetings, a listing of Rancho Seco plant data, and the proposed reorganization of the Rancho Seco Maintenance Department. A completed protocol, and the materials/references obtained at the site are part of the MSPP file. The material has been cleared by Sacramento Municipal Utility District with respect to 10 CFR 2.790 (Public Inspections, exemptions, requests for withholding).

C. DESCRIPTIVE DATA:

1. Organization and Administration

a. General Description

The entire organization of the Rancho Seco plant, including the Maintenance Department, is in the midst of a gradual but significant change in size, structure, and operating philosophy. In essence, it is moving to a much larger organization with more of a vertical, line-management-oriented approach. The Sacramento Municipal Utility District (SMUD) has taken on a new corporate motto to move from "sufficiency to perfection."

One aspect of this change is in the organizational structure. No major organizational change had taken place over the past several years, despite a tripling in maintenance staff. The formal organization as it currently exists has the I&C and electrical functions combined, and the I&C Superintendent and Mechanical Superintendent report directly to the Plant Superintendent. The whole plant, including the Maintenance Department, is in the process of an "interim change" (see Figure 1). The major change in the interim organization is to separate I&C and electrical and to place the electrical functions under an interim Nuclear Electrical Superintendent. A final organizational structure has been conceived and is in the process of internal review. It will then be reviewed by the SMUD Board of Directors. The new organizational structure is to be implemented in the summer of 1986. The main changes as they affect the Maintenance Department are the formalization of the Nuclear Electrical Superintendent position and Nuclear Electrical Department and the addition of a Maintenance Manager. Under the proposed reorganization, the electrical, mechanical, and I&C superintendents will report to the Maintenance Manager, who, in turn, will report to the Plant Manager. In addition to the organization structural change, maintenance staff size is to increase by about 50% from the end of 1985 to the end of 1986. As the size of the organization increases, communication among work groups may become more difficult. The Maintenance Department has experienced some communication problems with Operations and the Design Group in the past, but has now implemented several programs to overcome the communication difficulties (e.g., some cross-training of operators and maintenance staff).

Another aspect of the organizational change is to increase the amount of supervision of maintenance work in the field. Foreman-level supervision had been limited by the paperwork requirements of the job (e.g., getting Work Request sign-offs, doing job planning, and getting Radiation Work Permits). New job positions have been created and filled to lessen most of the

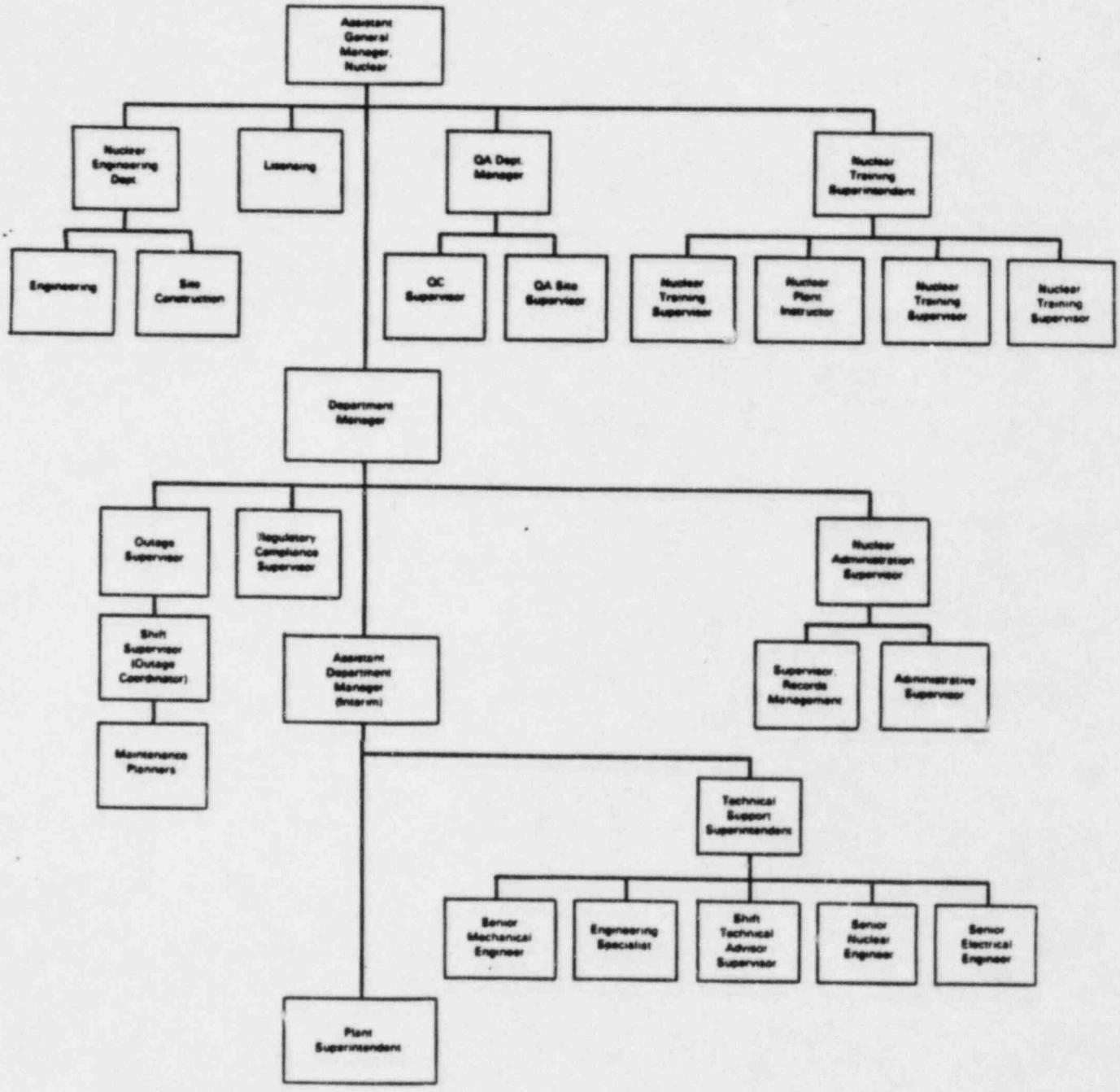



Figure 1. Rancho Seco Organization Chart

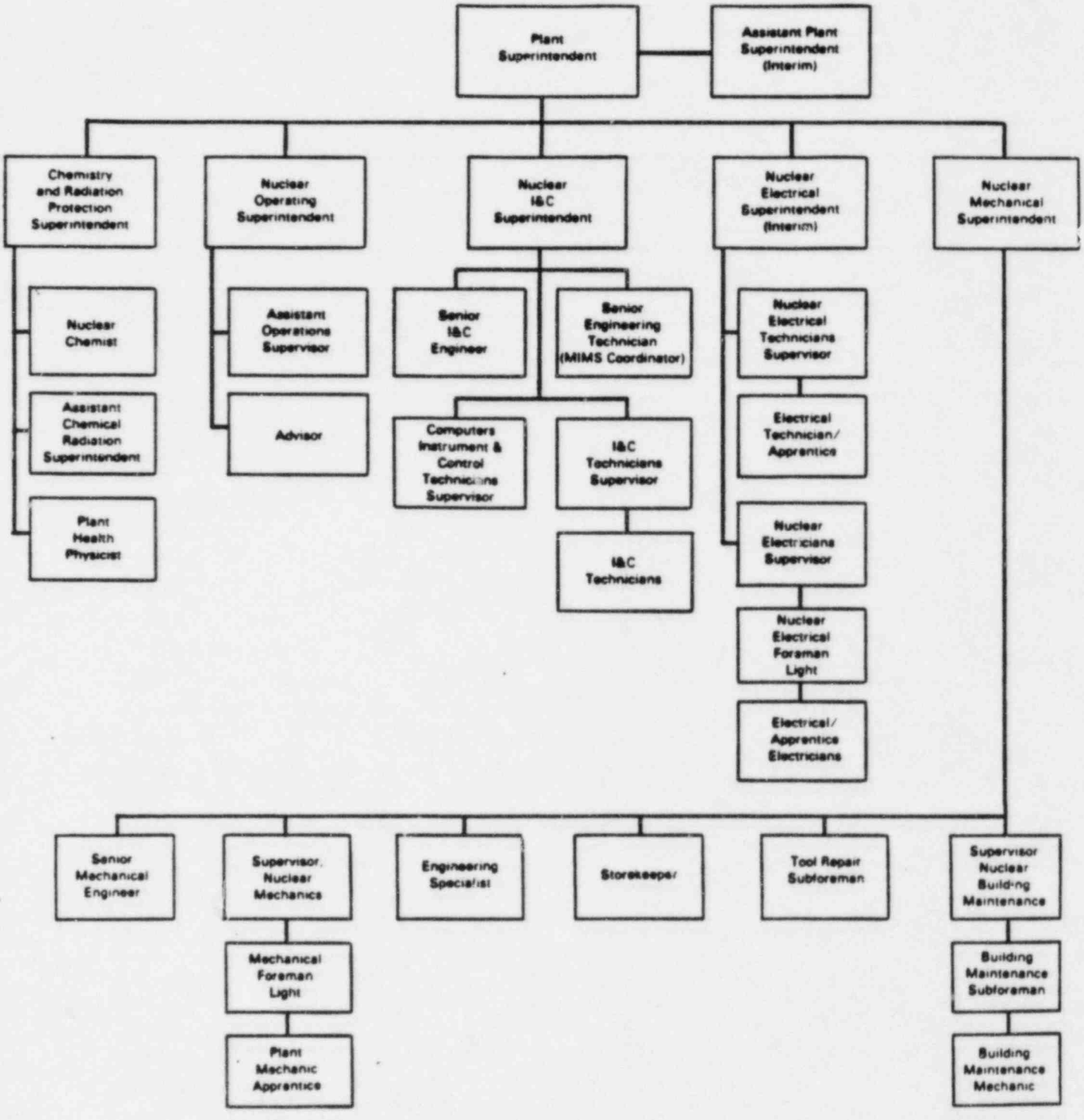



Figure 1 (cont'd)

paperwork burden. In addition, a policy has been set for the amount of time that all supervisors are expected to be in the plant observing and supervising work.

The licensee is also implementing a more formal approach to maintenance. In the past, definitions and goals for maintenance were not set down in administrative policies and procedures. No formal evaluation of the maintenance program was carried out. The plant is moving to the use of the NUMARC and other indicators to track Maintenance Department performance.

b. Specific Observations

The organization of the maintenance program underwent a structural change in August of 1983, when the Maintenance Superintendent position was dropped and the Plant Superintendent, Electrical/Instrument and Control (I&C) Superintendent, and Mechanical Superintendent absorbed the functions. This consolidation was probably only possible because the Maintenance Superintendent was the person moved up to the Plant Superintendent position. Since that time there has not been a Maintenance Superintendent, but the proposed reorganization for Rancho Seco includes a reintroduction of the Maintenance Manager (Superintendent) position (See Appendix D). The Plant Superintendent stated that in retrospect it was probably a mistake to do away with the Maintenance Superintendent position, because, in a time of expanding staff, more supervisors, rather than fewer, were needed. In seeing the need and being advised by the Institute of Nuclear Power Operations (INPO) to reduce the number of staff being supervised by a single individual, the plant is now in the midst of an interim change involving the addition of supervisory staff. The interim organizational structure, as of September 1984, took the form shown in Figure 1.

A final plan for the organization structure is being developed, pending more input from a contractor who is helping with the restructuring. The schedule for implementation is Summer, 1986. The proposed structure for the overall plant organization is shown in Appendix D.

The survey team was also provided with information concerning planned restructuring of the Maintenance Department next summer. The proposed (the new structure has not been approved by the SMUD Board of Directors yet) organizational structure for the Maintenance Department is also shown in Appendix D. The reorganization reflects a heightened emphasis on preventive maintenance. The reorganization also will add a planner to each of the three maintenance work groups. This will remove the planning function from the foremen, which will allow them more time to spend in direct supervision.

INPO recently suggested that the plant increase the amount of direct maintenance supervision. A memo was recently written by the Maintenance Department Manager setting specific goals for the amount of time supervisory staff are to spend in the field.

For Maintenance, the foremen are expected to spend four hours per day in the field, supervisors are expected to spend two hours per day in the field, and superintendents are expected to spend one hour per day in the field. These supervisory staff have been directed to pay close attention to: 1) Safety practices and the proper use of tools and other materials; 2) radiation protection practices; 3) the proper use and adequacy of procedures; 4) sufficient level of detail on the Work Request; 5) coordination and conflict between the various work groups; 6) housekeeping practices; and 7) quality of the workmanship.

The administrative policies and procedures are informal in that they do not include, for example, definitions of preventive, corrective, and predictive maintenance or specific goals and objectives for the different types of maintenance. The plant has moved to a more structured approach, using the NUMARC and other indicators to track maintenance and operations (the Monthly NUMARC Trend Report lists 43 variables that are tracked under nine broad headings: plant operations, engineering configuration controls, industrial safety, maintenance work requests, nonconformance reports, quality assurance, radiological protection, reportable occurrences, and 10CFR50.59 reviews). Plant maintenance supervisory and management staff have formulated ideas for applying the NUMARC indicators to Rancho Seco. In general, these staff believe that the NUMARC indicators should be modified to be more specific to the maintenance program.

There is a stated goal at the plant of an approximate 60%/40% split of work for preventive maintenance and corrective maintenance, respectively. Right now, non-outage preventive maintenance is estimated at 30% to 40% depending on the work group (i.e., I&C, electrical, and mechanical), and time spent on corrective maintenance is estimated at 40% to 50%. The remaining 10% to 30% is spent on other activities, such as surveillance testing, troubleshooting, plant betterment, and training.

The backlog of total delinquent preventive maintenance work requests was approximately 490 at the end of August, 1985. The backlog of corrective maintenance work requests was 1633 at the end of September, 1985. Of these outstanding Work Requests, 20 to 30 were high priority (i.e., needed to be done to keep the plant operational). A monthly data sheet is published listing the outstanding corrective maintenance Work Requests in a 2 X 2 matrix (maintenance group responsible versus Work Request

status). The outstanding Work Requests for the major maintenance groups are: building maintenance (139), contractor maintenance (198), electrical maintenance (207), electrical technician maintenance (38), I&C (256), mechanical maintenance (502), Nuclear Engineering Department regarding site construction (175), security and computers (49), and test engineering (45). The status of the outstanding Work Requests for the major status categories is: cold shutdown (32), equipment outage (35), still being engineered (360), power operations (1038), awaiting parts (56), and refueling (101).

Major modifications at the plant are done by contractors under the supervision of the Nuclear Engineering Department's Site Construction Group. The calendar year 1985 maintenance budget is approximately $20M to $25M.

Communication at the plant was fairly informal in the past. Communication is more formalized now through daily meetings between the Plant Superintendent and the superintendents who report to him. There was a communications problem in the past between plant staff and Design City staff (Design City is a term used by plant staff to describe the trailer city just outside the plant fence, where contractor staff and some SMUD staff, who are involved with the major modification design work). The plant has moved to address this problem by creating a liaison between plant staff and design staff. Rancho Seco has started training contractors on plant operations and have started to require contractors to spend more time in the plant. Design staff are now required by procedure to walk down their designs in the plant before the design is accepted (in the past, the failure to do so led to design problems). In the past there had also been a communications problem between the operations staff and the maintenance staff. Rancho Seco recognized this and has taken steps to correct it by cross-training operations and maintenance staff.

2. Facilities and Equipment

a. General Description

The survey team observed that existing facilities did not hinder the execution of maintenance work. In addition, the plant craft and supervisory staff who were interviewed stated that the existing facilities at Rancho Seco were adequate and did not negatively affect maintenance activities. The workshop areas for mechanical maintenance, fabrication, and welding are of sufficient size to accommodate all of the maintenance work requirements. The electrical and I&C work areas have improved since the construction of the Training and Records (T&R) Building. Prior to that time, the electrical and I&C work areas were somewhat confined but, according to plant staff, had no significant impact on maintenance activities from a work flow

standpoint. One specific area where a shortcoming was observed is the contaminated tools storage area in the Auxiliary Building. This area is small and was not originally designed to be a contaminated item storage area (see next page). The result is the unavailability of some tools due to pigeon holing, which causes some maintenance delays.

The survey team judged the present warehouse storage capacity adequate with approximately 29,000 square feet of spare parts storage. Additionally, special tools for specific maintenance tasks are stored in 40-foot trailers and moved to specific areas when they are required. The control of spare parts inventory is not automated. As a result, the availability of spare parts cannot be determined by maintenance personnel on a daily basis without going to the warehouse. An inventory catalogue exists, but it is only updated approximately once per week. The craftsmen also indicated that it was difficult to use, because the items are indexed by component number and not by a common name.

According to plant staff, the lack of spare parts holds up maintenance approximately once per week on the average. This problem is related to the lack of an automated inventory control system and weekly (instead of "real time") updates of the spare parts inventory. It has been observed by plant staff that the spare parts demand has increased as Rancho Seco gets older. No planning has yet been done to handle the expected increase in the demand for spare parts. SMUD participates in a cooperative spare parts program with six other utilities. This cooperative spare parts program allows more immediate delivery of parts than would be the case if they were ordered through a manufacturer. Thus, this helps reduce Rancho Seco's awaiting parts time.

b. Specific Observations

Plant staff indicated the necessity to rely on their own memory in order to predict requirements for long-lead-time spares. The three maintenance units also rely on individual memory for tracking problems with pieces of equipment. The component/equipment historical data are available in a manual system (i.e., file drawer), but there is no automated historical data file and no formal trending program.

Rancho Seco provides Nuclear Plant Reliability Data System (NPRDS) data to INPO, but the data are not yet being used at Rancho Seco in a formal trending program. Rancho Seco is having difficulty with NPRDS data retrieval from INPO.

Inservice inspections are performed on required equipment/systems only, and the results are not factored into the preventive maintenance program.

The size of the contaminated tools storage area was determined on the basis of available space. As a result, the storage area is only 8' X 20' and does not have the capacity to store all contaminated tools. Because of this, contaminated tools are pigeon-holed throughout the Auxiliary Building. In some instances, maintenance has been delayed while searching for these tools. A system had to be developed for the control of contaminated tools when it was recognized that too many "clean" tools were finding their way to the contaminated storage area. Presently, when maintenance is required in the Auxiliary Building, no clean tools are brought in until the availability of required tools is assessed in the contaminated storage area. If the work requires a tool that is not available from the contaminated storage area, a runner is sent to the clean tool crib to obtain the tool. This has decreased the rate at which clean tools become contaminated and unavailable for other maintenance activities.

The greatest number of maintenance hours are expended on: 1) low pressure turbine, 2) heat exchangers, and 3) valves. The specific maintenance tasks where the greatest number of man-hours are expended are: 1) valve leakage control and 2) pipe leakage control.

Some predictive maintenance is practiced at Rancho Seco. Oil samples from selected components are analyzed. Vibration monitoring was contracted out until the recent purchase of a Hewlett-Packard computer specifically for vibration monitoring. Use of the computer has been limited to date, but plans are to increase the frequency of its use. It is, therefore, premature to assess the impact of this tool on the maintenance program.

In the judgment of the survey team, labelling practices at Rancho Seco need improvement. Labelling has been the cause of some "wrong train" problems. As an example, maintenance was performed on the wrong diesel generator train and a mechanic replaced the V-belts on the wrong air start compressor.

The plant staff indicated that the spaciousness of the plant enhanced their ability to perform maintenance--i.e., lack of work space and laydown space had not been a problem. They also noted, however, that the large amount of backfit work is creating a maintainability problem.

Heat and noise were stated by plant staff to be the environmental features that most affect the performance of maintenance.

There are two levels of housekeeping practiced at Rancho Seco. These practices are dependent on whether the plant area is controlled (i.e, a radiation zone), which has the more stringent requirements for cleanliness, or uncontrolled, which has less

stringent requirements for cleanliness. The cleanliness requirements were set by plant management and are specified in an Administrative Procedure.

3. Technical Procedures:

a. General Description

The determination of which maintenance procedures needed to be written was made prior to plant start-up by contractor and Rancho Seco staff. Since that time, new maintenance procedures have been written on an as-needed basis. The plant is moving to a more formalized program for writing procedures. For instance, all of the maintenance procedure are required by Administrative Procedure to be reviewed every two years. When the maintenance groups (electrical, mechanical, and I&C) now carry out the required two-year review, they are using Administrative Procedure 2, Enclosure 4.11, which is a checklist based on INPO guidance for verifying the usability of the maintenance procedures. If a procedure will not be used by the craftsman in carrying out maintenance work or if the procedure that is to be used does not contain QC hold points, engineers in the maintenance groups may set QC hold points in the Work Request package. The maintenance engineer also determines whether a procedure is to be used in carrying out maintenance work and if so, which one. The requirements for post-maintenance testing are specified by Administrative Procedures 3 and 4. The maintenance engineer uses this document to specify the post-maintenance testing requirements in the Work Request package. Each of the maintenance units (I&C, electrical, and mechanical) are responsible for writing, verifying, and validating their own procedures. Technical procedure format and content is specified in Administrative Procedure 2 and Administrative Procedure 301.

b. Specific Observations

When the maintenance procedures were first developed, the procedures were written by craftsmen. Now maintenance procedures are written and reviewed by maintenance engineers and the maintenance supervisors. Contractors, technical editors, and human factors specialists do not help write the procedures.

Administrative policy requires review of maintenance procedures every two years. The procedures are subjected to a verification and validation process. Validation is typically done by a craftsman by walking through the procedure actions. Otherwise, the procedure is validated by the craftsman during the first use. Verification had been informal in the past. However, during the latest two-year review cycle, all three of the maintenance units (I&C, mechanical, and electrical) are using the Administrative Procedure 2, Enclosure 4.11 checklist during

the two-year review. The checklist is based on INPO guidelines and is an accepted, formal method for verification.

Immediate changes are, at times, required for maintenance procedures as they are being used in the field because of obvious misstatements, missing information, and other causes. Changes that do not change the intent of the original written procedure may be made by the Shift Supervisor and a Senior Control Room Operator or by the Shift Supervisor and a Plant Engineer. Such agreed upon changes are called temporary changes, and the craftsman may then go ahead and use the procedure with the temporary change in it in the field. If the maintenance craftsman's supervisor determines that the temporary change should become a permanent change, the supervisor is required by Administrative Procedure to prepare a revision to the procedure and process it in the same manner as a normal revision. This supervisor also determines the expiration date of temporary changes. He also determines in which maintenance procedures temporary changes will be inserted. Then a time limit (expiration date) is placed on the temporary change. The supervisor is also responsible for inserting and removing (after expiration) temporary changes from the selected procedures. The Administrative Procedure requires that all temporary changes be documented and forwarded for review and approval by the supervisor, the Plant Review Committee chairman, and the Nuclear Plant Superintendent within seven days of implementation.

Revisions to procedures can be initiated by any maintenance craftsman or supervisor by submitting revisions to the relevant maintenance supervisor. Revisions receive the same review and approval as original procedures. The supervisor reviews revisions to procedures to determine if other procedures are also affected. If other procedures are affected, the supervisor routes the proposed procedure change to the appropriate supervisors along with Administrative Procedure 2, Enclosure 4.11 (the usability checklist). Upon approval of the procedure revision, the Nuclear Administration Supervisor has the revised procedure issued and distributed.

When a procedure is required by the Work Request, the foreman goes to the controlled procedure file, makes a copy of the procedure, and puts it with the work package for his craftsmen. Occasionally the craftsman will retrieve the procedure from the controlled procedures file, but it is ultimately the foreman's responsibility to make sure that the correct procedure is being used.

It is not specified in the Administrative Procedures that the QC Department specify the QC hold points in the maintenance procedures. Therefore, QC hold points are specified by the procedure writers. When QC hold points are put into the procedures by the procedures writers, then QC reviews these hold

points for agreement. If QC hold points are not placed directly in the maintenance procedures, the maintenance engineers have the option of specifying QC hold points in the Work Request Package. QC hold points put into the Work Request package are not reviewed by the QC Department.

Procedures must be used if they are specified in the Work Request (WR). Everybody at the plant that the survey team talked to from the Maintenance Department Manager down through the craft workers stated that they were aware of this policy. If a craftsman is not using a procedure when the use of one is required, sanctions against the craftsman are specified in the union contract (verbal warning, written warning, leave without pay, and termination).

4. Personnel:

a. General Description

The size of the maintenance staff has about tripled since 1978 (from around 80 craftsmen and supervisors) to the present 218 staff. The licensee is proposing to increase staff size even further (to approximately 325 staff) by the end of 1986. Part of this increase is to accommodate an increased work load and a perceived need to reduce the backlog. Part of the increase is also due to a new philosophy to use fewer contractors and more SMUD employees. Craft workers are represented by the International Brotherhood of Electrical Workers (IBEW).

b. Specific Observations

The Maintenance Department staff includes 47 craftsmen and supervisors in the electrical group, 40 in I&C, 121 in mechanical, and 10 startup engineers. This number is to expand by the end of 1986 to approximately 325 supervisory and craft staff, including 17 more craftsmen in electrical, 12 more technicians in I&C, and 76 more craftsmen in mechanical. In addition, the Systems Engineering groups, which provides engineering support to maintenance, is expanding from 40 to 120 engineers over the next year.

The plant presently works one 8-hour maintenance shift during normal operations and two, 10-hour shifts during outages. There has been some discussion of moving to more shift coverage during normal operations, partly because the expanded staff could impact the shop facilities. Currently, call outs are used to cover needed maintenance on the non-day shifts.

Turnover rates are available only for the plant staff as a whole and ranged from 3% to 5 1/2% over the past 3 years. The maintenance staff stated that their staff turnover rates had been slightly higher. Craft recruitment is carried out

locally. Local recruitment has been all that is necessary, since craft salaries paid by SMUD have been as good or better than craft salaries in other industries around Sacramento. Thus, some of the maintenance staff turnover has been to other SMUD electrical-generation facilities, so that all the craftsman loses in terms of pay is the nuclear pay premium.

Exempt salaries have been lower than the industry average for comparable positions. Supervisory staff who were interviewed saw this as a problem. In addition, administrators in the Personnel Department especially saw this as a problem. They had found that it has been very hard to recruit supervisory/management staff nationally because of the low pay (compared to the national average) at SMUD. In response to this problem, SMUD has just carried out a salary survey and has submitted a plan to the SMUD Board of Directors to raise certain exempt salaries to the 80th to 90th percentile for the industry. This plan had not been approved at the time of the survey.

All craftsmen are represented by IBEW Local 1245. The union contract specifies grievance policies, overtime policies, etc. Overtime pay is typically 1.5 times base pay. Double time pay is applicable in some situations. If a holiday is taken as a regularly scheduled work day, 2.5 times the pay base applies. A willingness to work overtime is a condition of employment. Overtime is first allocated to qualified volunteers. It is then distributed among employees within work groups in the classification involved as equally as practicable. Employees are not allowed to work more than 16 consecutive hours (unless the Plant Superintendent determines that plant conditions are endangering public health and safety in which case the Plant Superintendent has the ability to allow the craftsman to work more than 16 consecutive hours). The overtime rate for craftsmen has averaged about 26.5% from January through August of 1985. The rate was high because of this year's extended outage. The rate decreased to between 5% and 6% for the last two months. The overtime rate was approximately 10.5% for 1984. There were several unplanned outages, but no refueling outage in 1984. The overtime rate was approximately 16% in 1983, which was a refueling outage year.

SMUD has a documented appraisal system for craft and exempt staff. The craft appraisal system is not extensive. It is agreed upon during union negotiations. The exempt staff appraisal system had not been extensive, either. The pay system was called a merit system. This system was considered ineffective by the Personnel Department, and the Board was convinced by the former General Manager to implement a new system called Pay For Performance. The licensee hopes that this system, along with the anticipated new exempt salary structure, will allow SMUD to hire the best qualified people available

through national job searches and to increase the feeling of professionalism and job value among existing exempt staff.

The SMUD Personnel Department is providing the necessary support for the plant to hire the new maintenance personnel over the next year. Actual hiring is done through the Personnel Department with heavy reliance on input from staff at Rancho Seco who interview the potential hires. Personnel staff are carrying out job/task analyses on new and some existing positions, have written the position descriptions for the hiring, and have carried out a national recruitment for exempt staff. They have also planned and implemented a formalized staffing plan for decreasing the number of contractor personnel and replacing them with to-be-hired SMUD employees. There is only a 0.8 Full-Time-Equivalent (FTE) staff assigned to Rancho Seco personnel matters. Others from the corporate personnel department help on an as-needed basis.

The Training Department adopted a formalized Systems Approach to Training (SAT) about two years ago. Since that time, new trainers have been promoted from the craft ranks and have been given classes on developing courses and and delivering lectures. There are six training instructors involved with maintenance training. All came from the craft ranks and have been provided with training by the licensee on how to develop lesson plans according to the systems approach to training being used by the department. The trainers also either have been or will be given instructions by the licensee on teaching techniques before they teach in the classroom. Most of the new trainers time over the past two years has been spent in developing course objectives, lesson plans, and course materials. The full training program is not yet in place in terms of the classes which will be provided.

Program Descriptions have been developed for the Mechanical Maintenance Training Program, the Instrument and Control Technician Training Program, the Instrument and Control (Computers) Technician Training Program, the Electrical Technician Training Program, and the Electrical Maintenance Training Program. The Program Descriptions include a statement of the training goals, a brief description of the structure of the training program, the initial training classroom courses, the initial on-the-job training, and the continuing classroom training. They will start using the materials on a limited basis in January 1986. All classroom materials are to be in place by June 1986. The Training Department has committed to INPO accreditation by the end of 1986. Rancho Seco's self-evaluation is scheduled for September 1986.

The stated goal of the Training Department is to have the crafts people spend at least 70% of their time in classroom and workshop training. Attendance documentation for training over

the past two years has shown that maintenance staff have spent about 4% to 5% of their time in training in 1983 and 1984. Because of the extended outage, the 10% goal is unlikely to be reached in 1985.

At present, there are three classrooms (two hold 20 students each and one holds 8 students) in the Training and Records (T&R) building dedicated to maintenance training. There are also four trailers that are shared among Maintenance, Operations, and Site Support for training purposes. There are no maintenance training workshops. There are plans to build a new training building that will include training workshops for the maintenance crafts. The building is scheduled to be completed by the end of 1988, but it may be done sooner if there are no major outages over the next 18 months.

5. Work Control

a. General Description

Work control and planning and scheduling (P/S) are presently in a state of flux. Bechtel is currently doing a study for SMUD to make recommendations for changes to the current system. As of this point in time, the Bechtel study is approximately 50% complete.

Prior to implementation of preliminary Bechtel study, recommendations, and the recent reorganization, the Work Request system was seen as inefficient by the maintenance department supervisors and craftsmen. Since the foremen were responsible for scheduling, planning, ensuring clearance, and system walkdown, the level of supervision on each job was less than Rancho Seco management staff and the INPO inspection team felt was needed. "Stand-Around-Time" was estimated by plant staff (crafts) to be between 30% and 50%, which was considered too high by the staff providing the estimates. In the opinion of the survey team, the present system, which includes a plant clearance coordinator and a planner placed in each of the individual maintenance groups (I&C, electrical, and mechanical), should improve the performance of maintenance at Rancho Seco through a more efficient work control system.

b. Specific Observations

A formal, well-documented means of integrating preventive maintenance, corrective maintenance, and surveillance testing does not presently exist at Rancho Seco. Any integration is done on an informal and infrequent basis by individual maintenance craftsmen using manual equipment history files.

Individual maintenance groups (I&C, electrical, and mechanical) are just beginning to develop a root cause analysis unit within each group for input to the preventive maintenance program.

The light foremen stated that Work Requests are often held up for the need of a signature because the Shift Supervisor is attending to shift turnover (when only operations people are allowed in the control room and surrounding office area) or because of the requirement that the Shift Supervisor "walk the plant" for two hours each day to observe ongoing activities. QC only performs inspections as indicated by the Work Request and therefore does not perform any random inspections of ongoing maintenance work. QA has carried out random audits of maintenance work and makes the results of these audits available to the QC department.

The engineers within each of the three maintenance work groups specify QC hold points on the WRs based on experience and system knowledge. They also determine fire protection and safety requirements based on knowledge and experience. QC does not review the WRs to determine if additional hold points should be required. The fire protection and safety staff do not review WRs for input. However, fire protection staff will, by December 1985, provide a checklist to the engineers that provides guidelines on when fire protection input is needed. QC hold points are not used in procedures dealing with non-safety-related equipment even if the work is code related.

A daily work plan was instituted within the last year. The daily work plan was developed to provide plant staff with a daily status of ongoing maintenance as well as a record of maintenance to be performed. The work plan is developed in the afternoon of the day before it is to be implemented. The work plan is then reviewed by plant supervisory staff during the morning meeting. The daily work plan, however, only infrequently specifies QC requirements for each WR, even though the work plan has a column available specifically for this type of information. QC generally is not scheduled to interface with the maintenance activities.

Within the past two months, a new system was implemented to allow packing adjustments for valve leakage control on manual, non-safety-related valves without the need for a WR. This has enabled the mechanics to make minor, on-the-spot adjustments to some manual valves without having to wait days for the WR to clear.

The maintenance staff indicated that there is not an effective system for documenting maintenance performance data such as man-hours expended, spare parts consumed, special equipment required, and unusual problems encountered during maintenance. The plant staff also indicated that the WR system and the

Maintenance Information Management System (MIMS) are not presently as effective as they could be. However, mechanical maintenance has just recently established the following aids to document some maintenance performance data: 1) mini root cause program; 2) mechanics aid file (tools used, problems encountered during previous maintenance on the component/system, equipment and special techniques used, etc.); and 3) review of WRs for input to the preventive maintenance program. The Mechanical Maintenance Superintendent intends to incorporate these aids into the preventive maintenance program.

The supervisors and managers at Rancho Seco believe that being constrained as a municipality to award maintenance contracts on the basis of low bid has created some problems with respect to the quality of the contracted work. While specific instances of less than acceptable quality work were not specified, the staff stated that their preferred contractors had not won several important bids over the past several years.

Prior to the present WR system, the foremen did all of the job planning, which included obtaining clearances, preparing parts lists, obtaining proper procedures, and other tasks. Because of this, very little time was available for direct supervision of maintenance. In the opinion of plant supervisors and craftsmen, roughly 50% of the jobs were supervised. Since each maintenance group has created a WR planning function, the foremen now supervises roughly 95% (in the opinion of plant staff) of the maintenance jobs being performed.

The deficiency tag (orange tag) system has recently been initiated to prevent duplication of WRs for the same problem. Previously, several WRs were written by different personnel for the same deficiency. There was no way of knowing if a WR had been written or not. The orange tag on a piece of equipment now identifies that a WR has been written and prevents duplication of work.

D. CONCLUSIONS:

Conclusions are provided below for the five main protocol issue areas.

Organization and Administration. The Rancho Seco plant's Maintenance Department is in the middle of a significant change in size, structure, and operating philosophy. The changes have started this year and will extend into 1986. The maintenance staff size has almost tripled over the past five years (from less than 80 staff to approximately 220 staff at present), but the organizational structure had not changed in order to keep up with the increase. A consultant group was hired to help determine organizational structure and needed job functions. The Sacramento Municipal Utility District (SMUD) Personnel Department has carried out job/task analyses on new and some existing jobs, has written position descriptions for the jobs, and has carried out a national search for new supervisory and managerial personnel. The Personnel Department also worked with plant staff and developed a formal decision-making approach for determining which jobs that are now handled by contractors should be taken over by SMUD employees.

Other aspects of the maintenance program are not being treated in the same systematized manner, however. Preventive, corrective, and predictive maintenance are not defined in plant policies and procedures; and specific goals and objectives for maintenance had not been set in the past. Recently, the Nuclear Utilities Management and Human Resources Committee (NUMARC) indicators were adopted for use in tracking maintenance performance, and a stated goal of 60% has been set for craft worker time spent on preventive maintenance. Preventive maintenance supervisors have been added to the three maintenance work groups to help meet this goal. These types of goals have not been used in staff appraisals in the past. The new Pay For Performance appraisal system will allow such goals to be used for individual staff appraisals in the future.

The Maintenance Department has only recently recognized the need for more analytic techniques to help the work flow more efficiently. For example, the plant has no formal equipment trending system (one is to be implemented next year), no formal root cause analysis program (one is in the process of being implemented and should be fully implemented next year), no method for tracking long lead time spares, and no method for integrating surveillance tests, preventive maintenance, and corrective maintenance.

Inadequate supervision and poor communications in some areas have recently been recognized as problems. Formal policies on how much time a supervisor should spend out in the field were implemented in September 1985 to cover the supervision situation. The communication problems are being addressed through training, requiring design engineers to spend more time in the plant, and implementing a liaison position for interface between plant staff and contractor design engineers.

Facilities and Equipment. Maintenance workshop, spare parts storage, and tool storage requirements were not determined through an initial formal analysis. In most cases, the above facilities were taken over from the construction contractor. Expanding staff required more workshop space, which has been provided within the newly added Training and Records Building. At this time, contaminated item storage represents the only space problem. Lifting and rigging equipment did not adversely affect the performance of maintenance, according to plant maintenance staff.

Technical Procedures. According to one of the maintenance superintendents, maintenance procedures were not developed, controlled, and updated using a formal program in the past. Certain procedures were developed prior to initial start-up, and additional procedures have been developed on an as-needed basis since then. The plant is now moving to a more formal approach for procedure development. For example, Administrative Procedures (APs) exist that specify procedure format and content; APs exist that specify how procedures are initially written and approved, modified, and reviewed; and a checklist is also available, as an enclosure to one of the APs, to verify that the procedures are written correctly and accurately.

Personnel. Staffing considerations were made in a reactive manner in the past, i.e., no staffing level planning was done and hires were made in an attempt to catch up with an increasing work load. Following the Three Mile Island Unit 2 incident, numerous facility modifications and changes to the maintenance/surveillance programs were required. In an effort to keep up with the increased work, new SMUD staff and additional contractors were hired. However, the staff were not able to keep up with the increased modifications and Work Requests. Because of some maintenance-intensive equipment and several unplanned outages, the backlog of Work Requests increased greatly several years ago, and staff have not been able to reduce the backlog significantly in the past few years. The backlog, at the time of the survey, was 490 delinquent preventive maintenance WRs and 1633 corrective maintenance WRs.

Maintenance training has been limited. Only 2% to 3% of the maintenance staff members' time had been spent on training prior to 1983. Two years ago, the Training Department decided to obtain INPO accreditation and therefore began using a systematic approach to training development. The benefits of this approach are not expected to be felt until next year. While the stated goal is to have craftsmen spend at least 10% of their time in classroom training, training has occupied only 4% to 5% of the craftsmen's time in the last two years. Training workshops do not presently exist for I&C, electrical, and mechanical maintenance training, but are to be included in a new training facility.

Work Control. The survey team felt that the work control and the planning/scheduling system has been inefficient. The paperwork

requirements (e.g., getting operation staff sign-offs and getting radiation work permits) regarding the Work Request kept the first-level supervisors from doing much actual supervision. A recent analysis of plant needs in this area was carried out and several changes have been specified that should make the process more efficient. Next year a specific Scheduling Department is to be added, and planning positions are to be added to the three maintenance work groups.

The role of Quality Control (QC) regarding maintenance at Rancho Seco does not include certain responsibilities. For example, QC hold points are not set by QC staff (not required by Administrative Procedures), QC is not carried out on non-safety-related equipment, QC does not carry out random inspections, and QC is typically given little to no forewarning about the need for a QC inspection.

In summary, until this year, Rancho Seco's maintenance program was not based on a systematic approach to maintenance. As a result of recent maintenance initiatives, there are now elements of such an approach, especially in the training and staffing areas. The implementation of these and other modifications is currently ongoing and in various stages of completion. It is therefore too early for a survey team or the facility to determine how effective these changes will be.

## APPENDIXES

A. Plant Staff Interviewed During the Site Visit

B. Entrance Meeting Attendance and Exist Meeting Attendance

C. Rancho Seco Plant Data

D. Proposed Structure for Maintenance Department

# APPENDIX A - PLANT STAFF INTERVIEWED DURING THE SITE VISIT

| | |
|---|---|
| George Coward | Department Manager |
| Steve Redeker | Plant Superintendent |
| Ron Lawrence | Nuclear Mechanical Superintendent |
| Norm Brock | Nuclear Electrical/I&C Superintendent |
| Charlie Linxhart | Senior Electrical Engineer & Acting Nuclear Electrical Superintendent |
| Bill Spencer | Nuclear Operating Superintendent |
| Jim Field | Technical Support Superintendent |
| John Sullivan | QC Supervisor |
| Mike Hieronimus | Assistant Operations Supervisor |
| Jim Wilfong | MIMS/NPRDS Coordinator |
| Jim Jurkovich | Mgr. Construction Services Support |
| Buck Watson | Mechanical Maintenance Foreman |
| Kim Meyer | Mechanical Maintenance Foreman |
| Frank Lopez | Storekeeper |
| J. Dowson | QC Coordinator |
| J. Parman | QC Coordinator |
| John Jewett | QA Supervisor |
| Jim Shetler | Outage Supervisor |
| Wanda Wells | Nuclear Administration Supervisor |
| Evelyn Fallon | Personnel Specialist |
| Frank Thompson | Nuclear Training Supervisor (Acting) |
| John Bowser | Maintenance Training Supervisor (Acting) |
| Fred Kellie | Chemistry and Radiation Protection Superintendent |
| U. Witte | Fire Protection Consultant |
| W. Weaver | Safety |
| Two I&C Technicians | |
| One Electrician | |
| One Electrical Technician | |
| One Mechanical Maintenance Craftsman | |

# APPENDIX B - ENTRANCE MEETING ATTENDANCE AND EXIT MEETING ATTENDANCE

## Entrance Meeting Attendance (9-16-85 / 9:00 AM)

| | |
|---|---|
| Jim Field | SMUD |
| Charlie Linkhart | SMUD |
| John Sullivan | SMUD |
| Steve Redeker | SMUD |
| Jerry Delezenski | SMUD |
| Robert Roehler | SMUD |
| Mike Hieronimus | SMUD |
| Harvey Canter | SMUD |
| Mike Price | SMUD |
| Ron Lawrence | SMUD |
| George Coward | SMUD |
| Norm Brock | SMUD |
| Bob Fraser | SMUD |
| James Shetler | B&W |
| James Eckhardt | NRC |
| Tommy Le | NRC |
| Donald Brinkman | NRC |
| Bill Rankin | Battelle |
| John Boegel | Battelle |

## Exit Meeting Attendance (10-4-85 / 9:00 AM)

| | |
|---|---|
| harvey Canter | SMUD |
| John Jewett | SMUD |
| John Sullivan | SMUD |
| Steve Redeker | SMUD |
| Ron Lawrence | SMUD |
| Charlie Linkhart | SMUD |
| Norm Brock | SMUD |
| James Shetler | B&W |
| Jerry Barker | SMUD |
| J. Ed Smith | Duke Power Co. (Consultant to SMUD) |
| Sean McCloskey | Impell |
| W. S. Jurkovich | SMUD |
| Steve Crunk | SMUD |
| Robert Roehler | SMUD |
| Jim Field | SMUD |
| Harold Booher | NRC |
| Sydney Minor | NRC |
| John Martin | NRC |
| Tommy Le | NRC |
| Jim Eckhardt | NRC |
| Glen Perez | NRC |
| Bill Albert | NRC |
| John Boegel | Battelle |
| Bill Rankin | Battelle |

# APPENDIX C - RANCHO SECO PLANT DATA

Specific data about the Rancho Seco plant includes:

| | |
|---|---|
| Type | PWR |
| Licensed Thermal Power (MWt) | 2772 |
| Condenser Cooling Method | Tower |
| Condenser Cooling Water | Pond |
| Reactor Supplier | Babcock & Wilcox |
| Turbine-Gen. Mfr. | Westinghouse |
| Engineer | Bechtel |
| Constructor | Bechtel |
| Construction Permit | 10-11-68 |
| Operating License | 8-16-74 |
| Critical First Time | 9-16-74 |
| Commercial Operation | 4-18-75 |
| Most Recent SALP Ratings | |
| SALP Rept 50-312/85-18 for December 1, 1983 - May 21, 1985 | |
| Maintenance | 2 |
| Surveillance | 2 |
| Quality Program | 2 |

SALP Performance Categories - Definition

Category 1: Reduced NRC attention may be appropriate. Licensee management attention and involvement are aggressive and oriented toward nuclear safety; licensee resources are ample and effectively used so that a high level of performance with respect to operational safety or construction is being achieved.

Category 2: NRC attention should be maintained at normal levels. Licensee management attention and involvement are evident and concerned with nuclear safety; licensee resources are adequate and reasonably effective such that satisfactory performance with respect to operational safety or construction is being achieved.

Category 3: Both NRC and licensee attention should be increased. Licensee management attention or involvement is acceptable and considers nuclear safety, but weaknesses are evident; licensee resources appear to be strained or not effectively used so that minimally satisfactory performance with respect to operational safety or construction is being achieved.

# APPENDIX D - PROPOSED STRUCTURE FOR MAINTENANCE DEPARTMENT

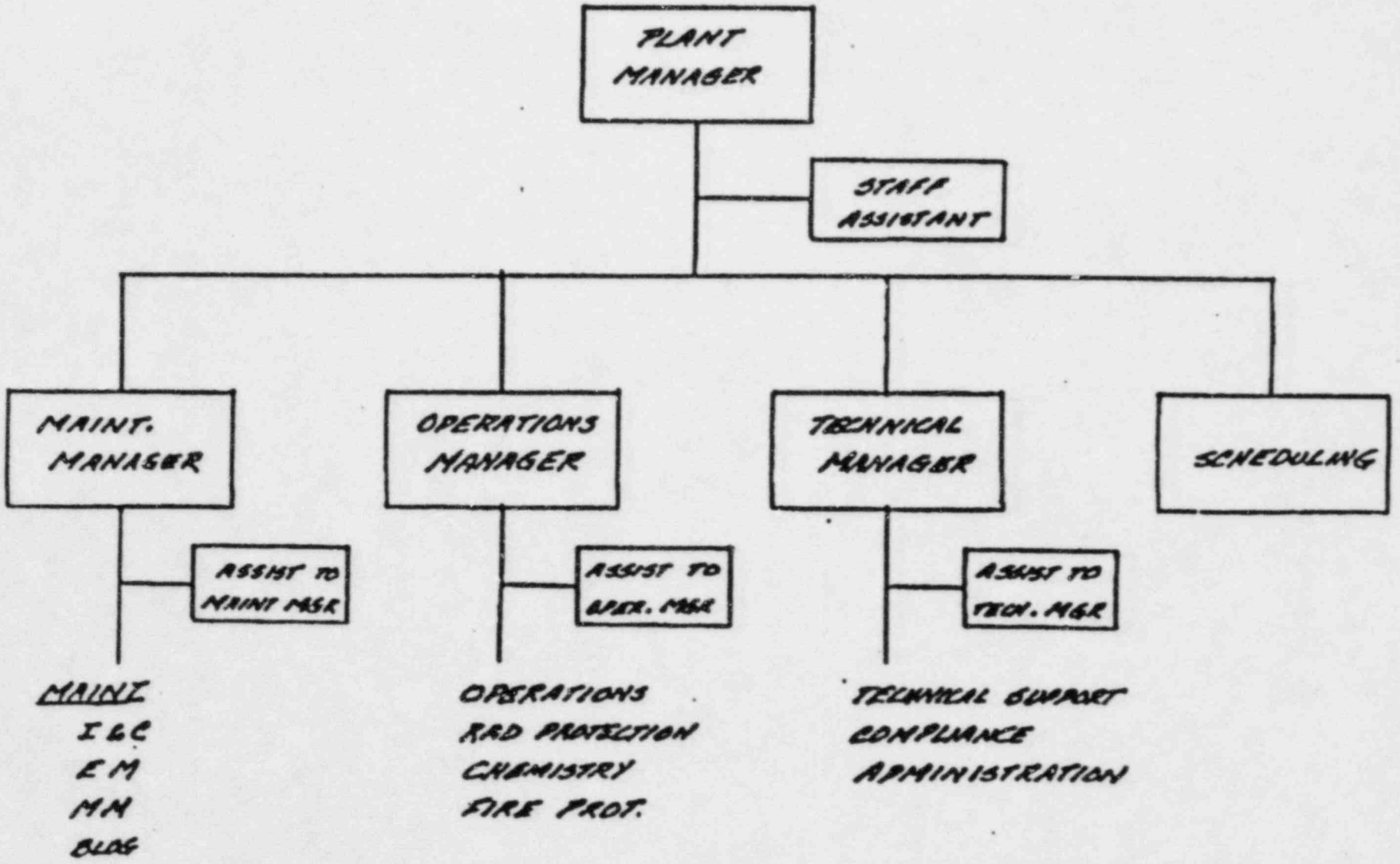
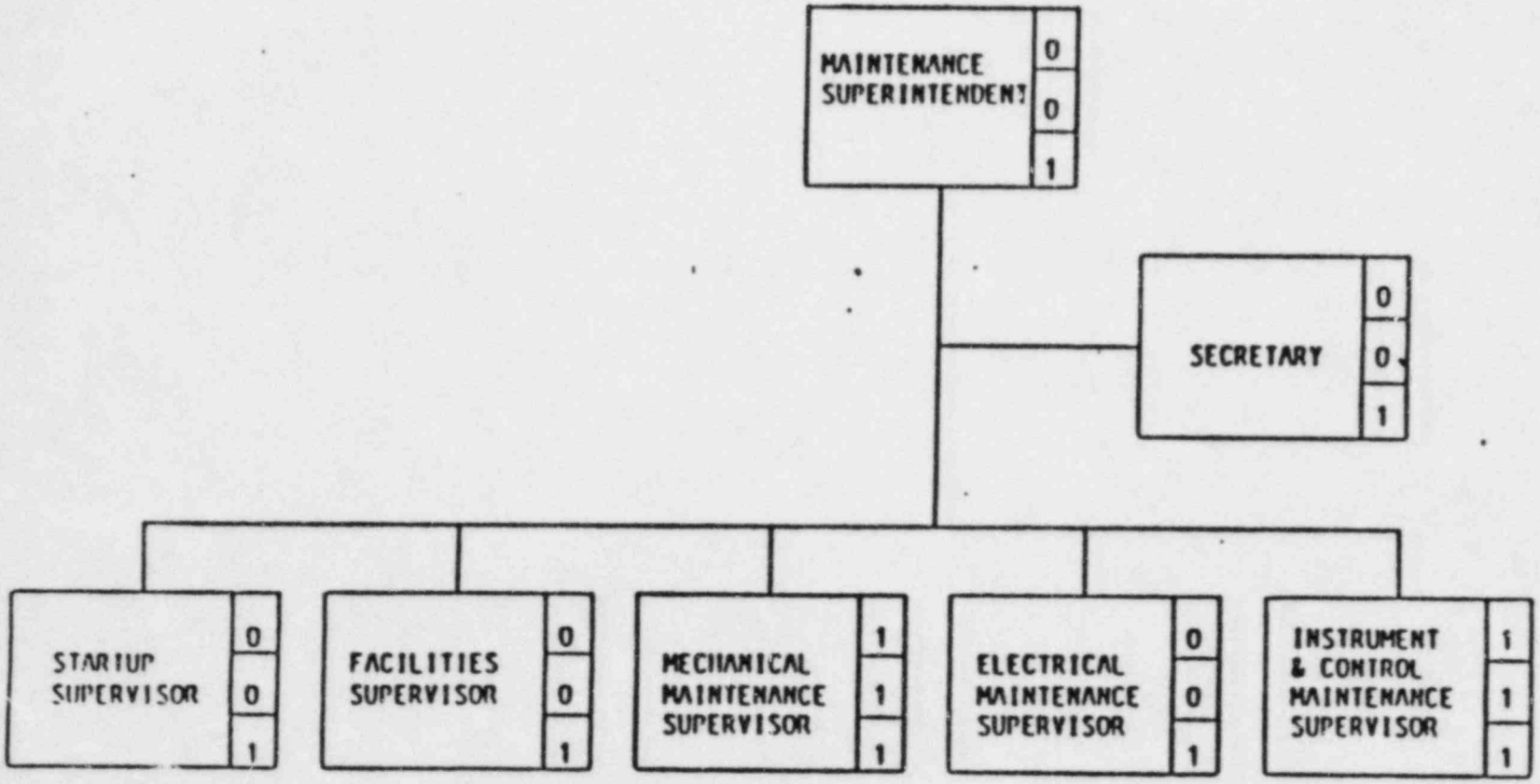
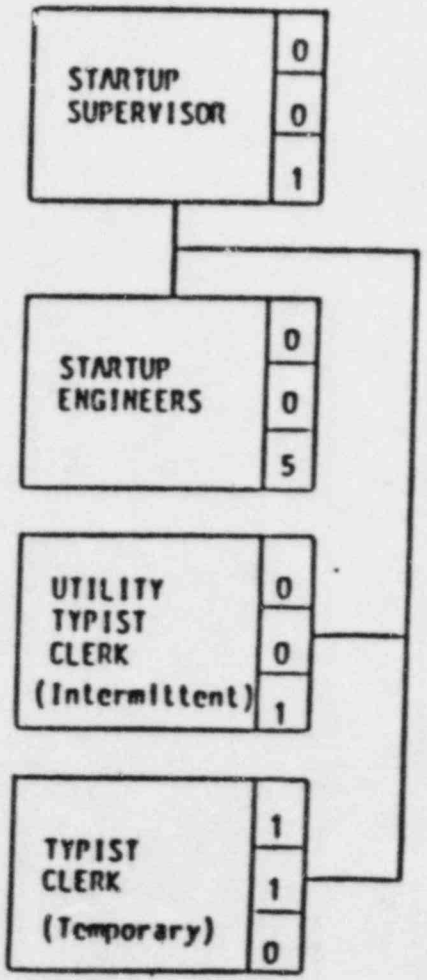



Figure D.1 Proposed Rancho Seco Plant-Wide Reorganization




| | |
|---|---|
| Payroll on 6-30-85 | 199 |
| Budgeted For 1985 | 225 |
| Budgeted For 1986 | 245 |

Figure D.2 Nuclear Operations Department
Maintenance Division




| | |
|---|---|
| Payroll on 6-30-05 | 1 |
| Budgeted For 1905 | 1 |
| Budgeted For 1906 | 7 |

Figure D.3 Nuclear Operations Department
Startup Division

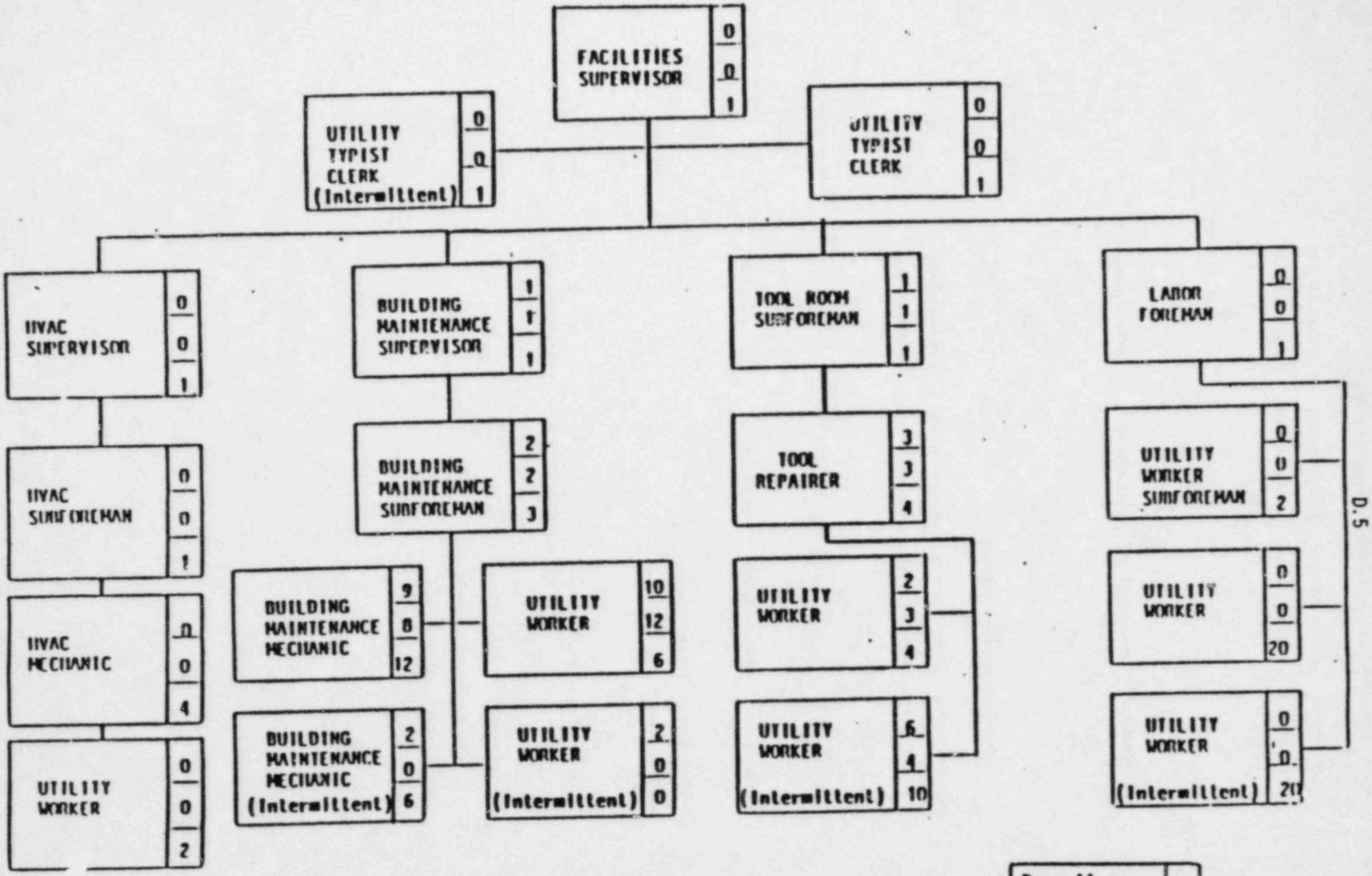



Figure D.4 Nuclear Operations Department
Facilities Maintenance Division

| | |
|---|---|
| Payroll on 6-30-05 | 38 |
| Budgeted For 1905 | 38 |
| Budgeted For 1906 | 101 |

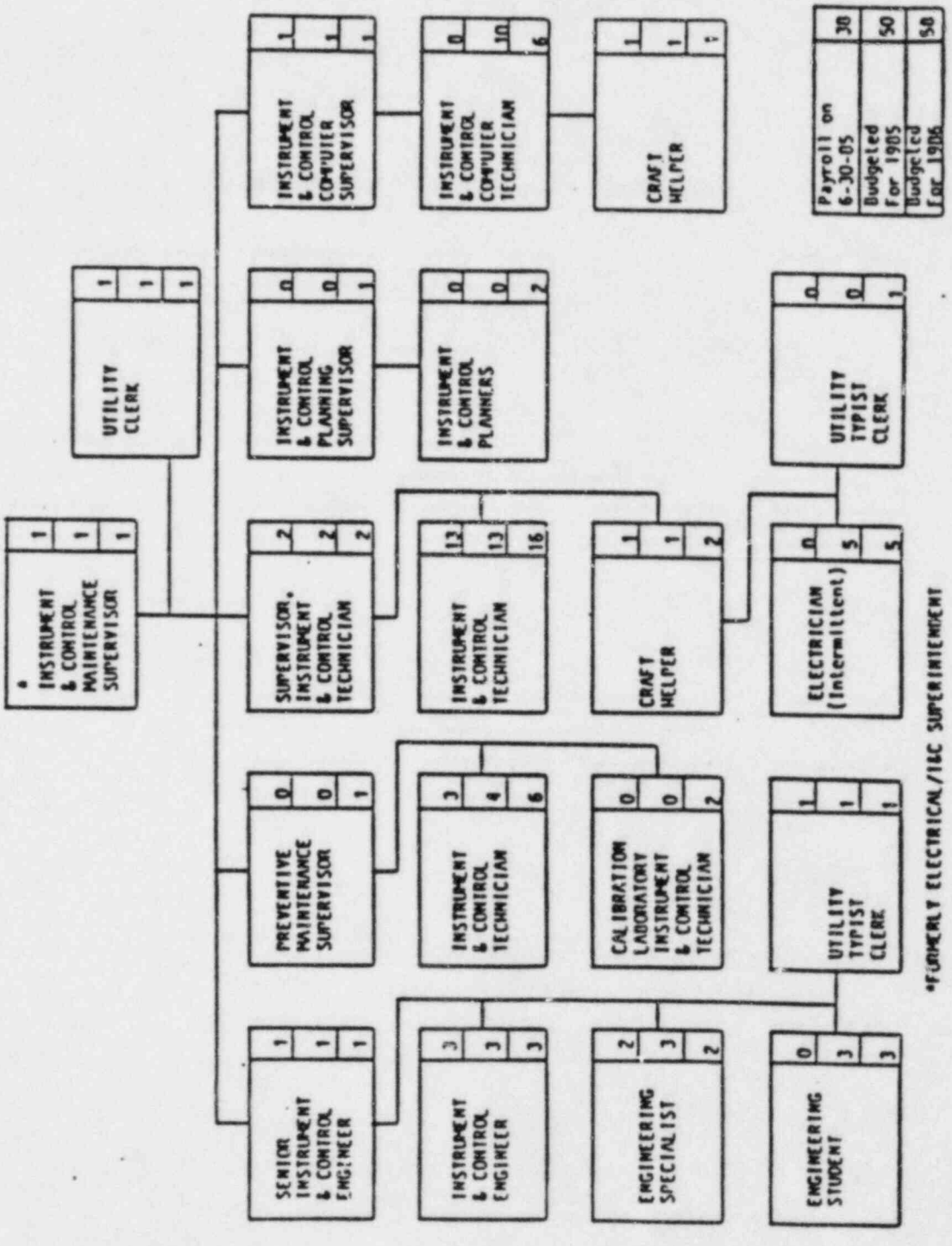



Figure D.5 Nuclear Operations Department
Instrument & Control Division

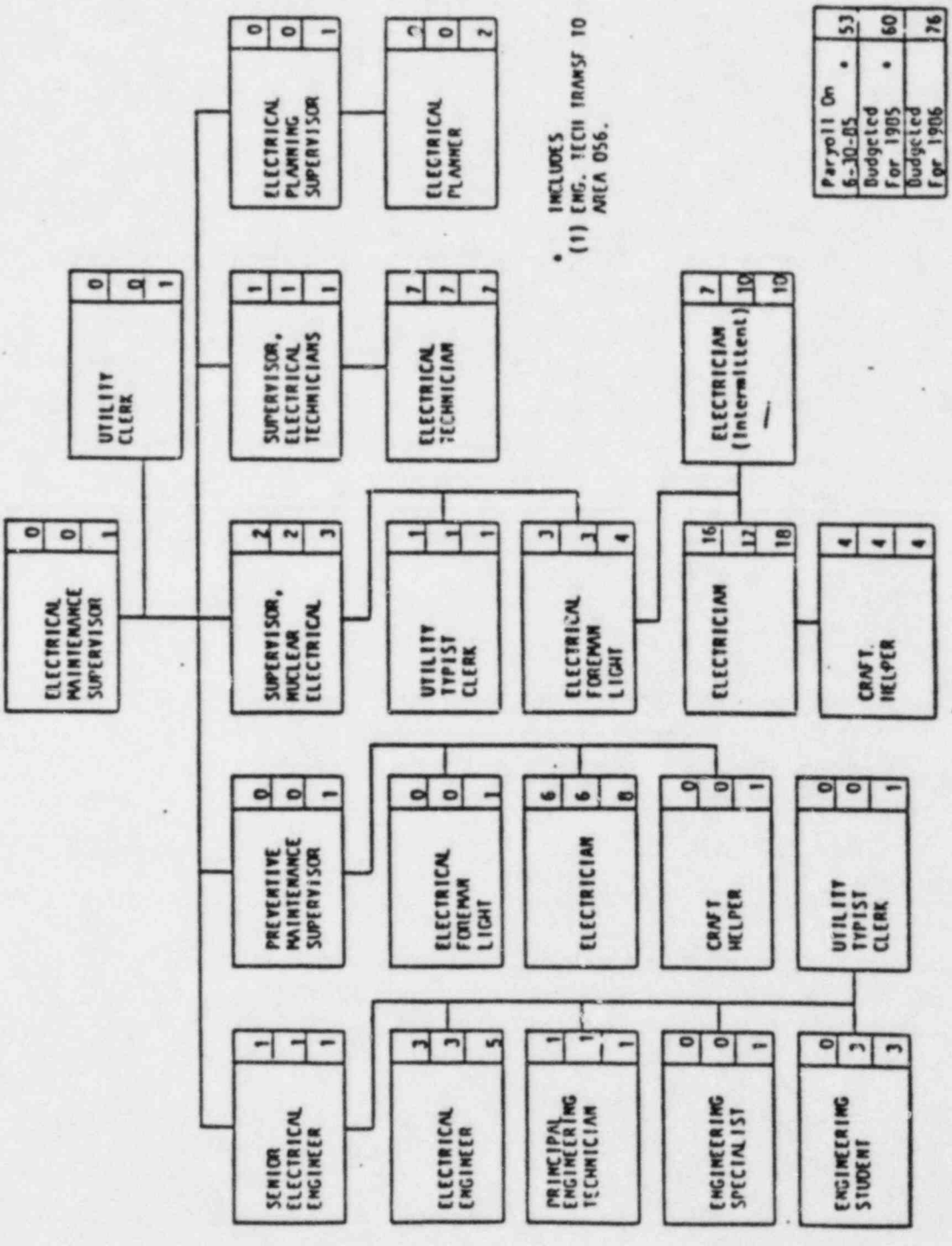



Figure D.6 Nuclear Operations Department
Electrical Maintenance Division

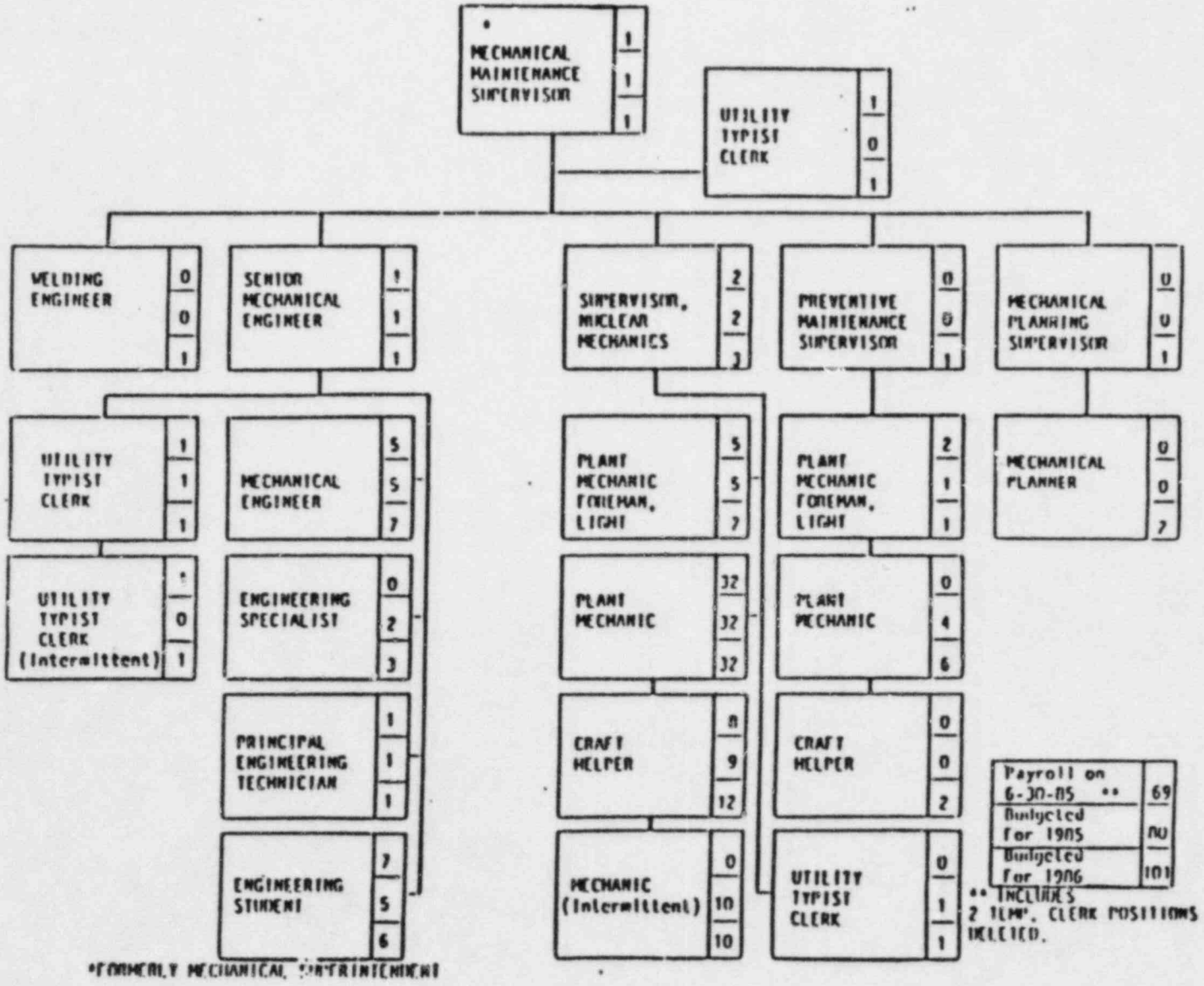



Figure D.7 Nuclear Operations Department
Mechanical Maintenance Division