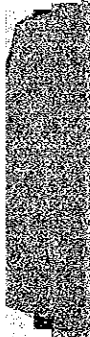


4. GENERAL STUDY AND CONSIDERATIONS



#### 4. GENERAL STUDY AND CONSIDERATIONS

##### 4.1 ORGANIZATION AND MANAGEMENT

Organizations related to thermal power plant operation and rehabilitation are composed of :

1) Metro Manila Regional Center

Generation, transmission and substation facilities of NAPOCOR are managed by six (6) Regional Centers under Utility Operations headed by the Vice President. Metro Manila Regional Center (MMRC), which is one of the Regional Centers, manages only four (4) thermal power stations in Metro Manila area. Bataan Thermal Power Station situated in other district belongs to Northern Luzon Regional Center (NLRC).

Technical divisions of MMRC are Technical Services Divisions (TSD) and Central Maintenance Division (CMD). TSD is composed of several sections, among of which are Electrical Section in charge of engineering design & evaluation, electrical protection relay system and electrical testing, Mechanical Section in charge of mechanical engineering related to design improvement and studies on mechanical equipments and promotion of new projects, and Chemical Section in charge of chemical engineering related to water, fuel, etc. in cooperation with chemical engineers of power plants. However, at present considerable man power assigned in TSD were temporarily assigned to other functional groups & many positions are vacant so that scheduled jobs have not been performed satisfactorily.

CMD office is, at present, temporarily situated in Gardner/Snyder Thermal Power Station and so new CMD office at

some other location is under planning. Technical Section of CMD is composed of Boiler, Turbine and Auxiliaries sections. CMD engineers are ordinarily assigned to major repair of each power station, and at present are assigned to the power stations undergoing overhauling since the power plants are continuously overhauled.

2) Power Station

Technical Section of power station is composed of Operation, Technical Services and Maintenance Sections. Maintenance Section is divided into General Service (administration of land, buildings and vehicle), Electrical Maintenance, and Mechanical Maintenance Sections. Mechanical Maintenance Section is responsible for minor corrective repair of plant facilities and budget preparation of his section.

3) Quality Assurance Group (QA Group)

QA Group was established in NAPOCOR Office in February 1981. The fundamental rationale for the QA is the attainment of sufficiency in electric power generation through the improvement of the quality levels of maintenance, repair, overhaul and operation of NAPOCOR's thermal plants. The QA Group's primary responsibility will be the establishment and implementation of programs in compliance with engineering quality and control and audit standards on procedures, dimensions, tolerance and specifications.

The nature of the QA Group function may be broadly categorized into two (2), namely, (a) it pertains to the job of analyzing/evaluating how and how well a specific task with respect to quality are being carried out, and (b) it entails

reporting to management the result of the evaluation or study in support of QA Group's planning and control functions; it may also furnish the particular thermal plant or division a result of the study for the implementation or adoption of appropriate measures.

The QA Group has three (3) work groups, namely; Engineering/Administration, Inspection and Test, and Audit.

The QA Engineering/Administration is responsible for the development of QA programs, standard manuals, and maintenance of data banks for the use of the whole division. It actually performs technical planning and servicing for the Group. Preventive and corrective type of inspection works are separately vested on the Inspection and Test group and the Audit group.

At present, QA Group has a total of 15 personnel; nine (9) for Inspection and Test group; three (3) for engineering and three (3) for the Office of the Manager, but Audit group is not yet manned; six (6) personnel will be added in near future. As a result of actual performance of QA Group up to the present, QA Group has carried out the preparation of the records on overhauling, and inspection and repair records on long time unit shutdown, and study of countermeasures against the plant troubles. These records were not available in the past, therefore, it will be strongly expected that the records prepared by QA Group should be effectively utilized for reference. Confirmation of specifications for materials and equipments received is one of the procurement works, however,

it has not been performed effectively because of lack of personnel.

4) Planning and Programming Group (P & P Group)

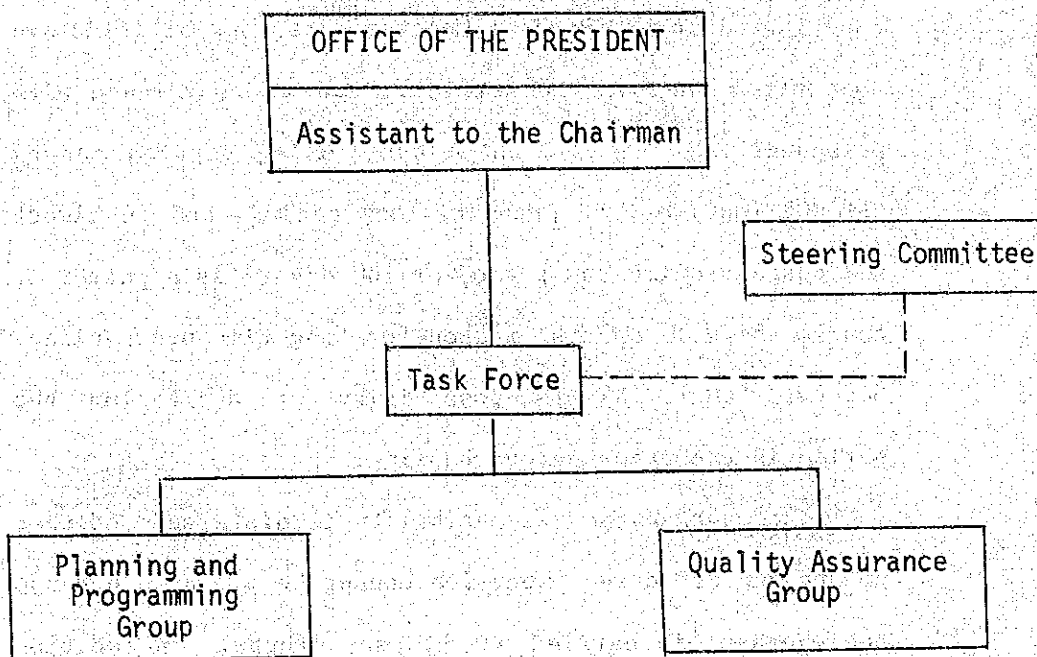
For the purpose of implementing the rehabilitation program, a lot of engineers of TSD were temporarily reassigned to P & P Group which has responsibility for planning, formation and supervision of the rehabilitation program, and the Group intends to perform the overall scheduling of overhauling, procurement of materials and equipments, and obtaining technical information and data in cooperation with CMD, power stations and manufacturers.

5) Task Force

For the purposes of planning and coordination of the Rehabilitation Program, Task Force was established in December, 1981 with P&P Group and QA Group as members of the Task Force positioned under the Office of the President.

Task Force supervises the management of overhaul scheduling and promotion/evaluation of procurement to perform Rehabilitation Program. The efforts of Task Force are highly appreciated, overmore will be expected to be effective management of overhaul shedule and procurement promotion which are essential factor of Rehabilitation Program. The composition of Task Force is as follows;

Fig. 4-1 TASK FORCE ORGANIZATION CHART

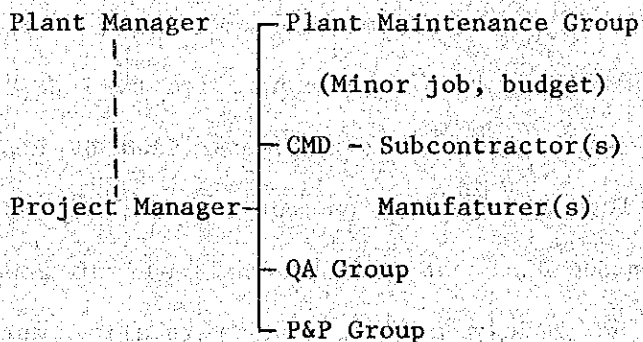


There exists some problems in execution of overhauling.

a. Organization for Execution of Overhauling:

Prior to the execution of overhauling a Project Manager in power plant is assigned, and the following organization for overhauling is established.

Fig. 4-2 ORGANIZATION FOR OVERHAULING



A Project Manager is selected from the Section Heads of power plant, and the grade is usually Operation Superintendent B. Project Manager's responsibilities are to control the overhaul schedule and to coordinate with personnel concerned. Annual overhauling carried out by NAPOCOR requires, at present, long period, and in almost all cases require the period of 100 days. As a matter of course there is special reason for long time overhauling, however, there exists possibility of shortening the period in the existing overhauling.

It seems that the responsibility is dispersed and that smooth and effective execution cannot be promoted because the overhaul is carried out by many groups. In addition to the above, assigning the Section Head who is not engaged in maintenance ordinarily as a Project Manager has a problem from the viewpoint of effective and smooth promotion of the overhaul.

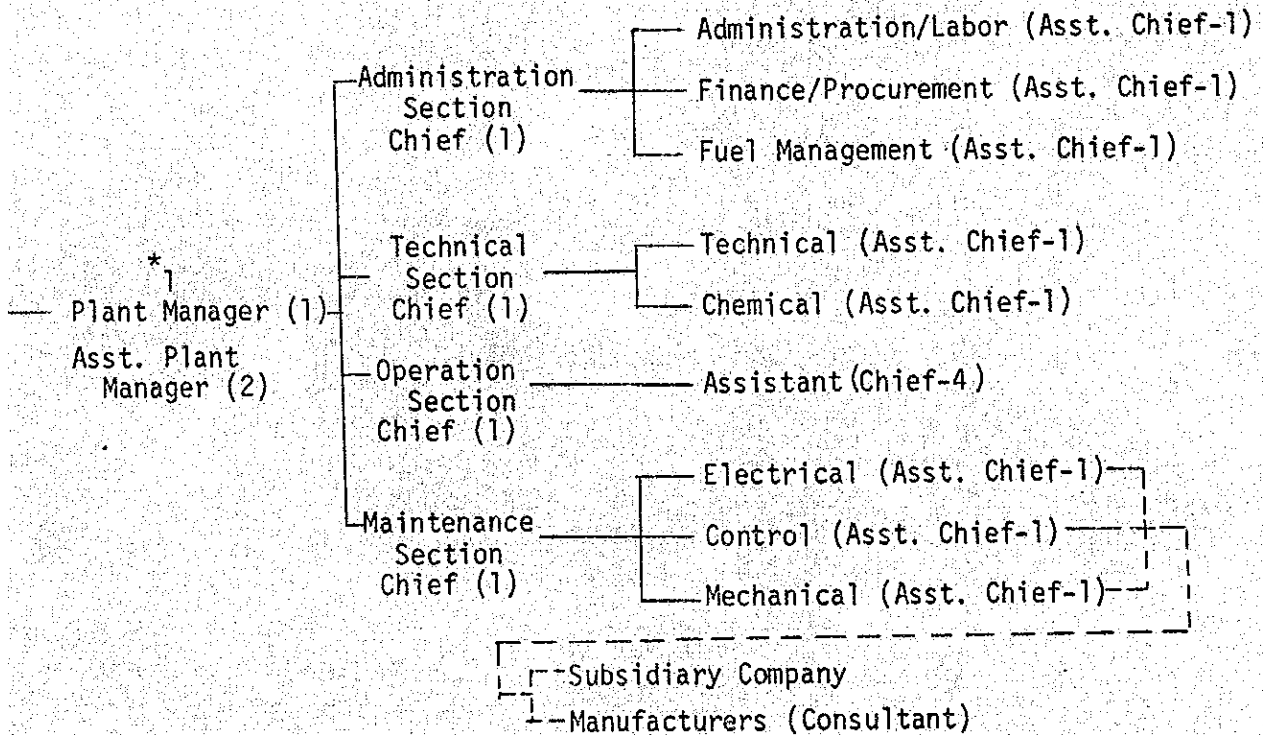
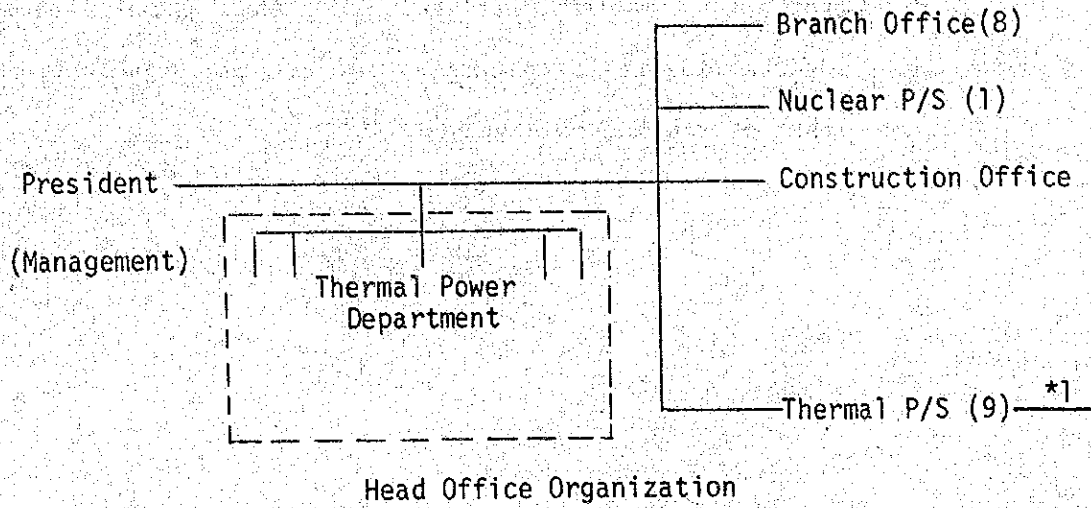
Maintenance Group of power station carries out material procurement scheduling, however, CMD carries out the actual overhauling works. This method lacks consistency.

To solve the above problems, it is desirable that overhauling schedule is controlled by P & P Group, and that overhauling works are supervised by Plant Manager. For future organization for overhauling works, it is recommendable that Maintenance Group of power stations will be mainly conduct the overhauling works and CMD will assist the Maintenance Group.



For reference, an organization for maintenance of a certain electric power company in Japan is presented below. Plant manager has broad powers and is responsible for all matters related to the power station. Overhauling has been carried out by same organization as that of routine maintenance.

Fig. 4-3 ORGANIZATION OF THERMAL POWER PLANT AT SOME ELECTRIC POWER Co. IN JAPAN



b. Organization for Engineering:

Results Group can be regarded as an engineering section in power station, and TSD in MMRC. However, it is said that Maintenance Section and Instruments/-Controls Section cannot afford to be engaged in the engineering because of fullness in ordinary works.

In a certain electric power company in Japan, major job of plant maintenance personnel is engineering since almost all of the maintenance works are carried out by subsidiary company.

Furthermore, NAPOCOR is planning the modification of organization including establishment of planning sections in power plant. It is recommendable that assignment of engineering should be well studied and clearly established.

c. Review on Adoption of Subsidiary Company:

Adopting subsidiary company maintenance planning and execution of maintenance work are able to be carried out by one (1) section.

In a certain electric power company in Japan, not only routine maintenance but also annual overhauling works are carried out by subsidiary company. Power plant personnel mainly carry out only the engineering works. Subsidiary company's personnel have capabilities of engineering more or less, and also carry out the construction and annual overhauling works, flexible overall operations of personnel are performed for the purpose of effective and smooth promotion.

Especially in NAPOCOR's power stations, it seems that maintenance of instruments/controls is inferior because there is not appropriate subcontractor. By the reason of difference in formation of management it seems to be difficult to apply the same system to NAPOCOR, however, it is worthy of reviewing the system.

d. Job Grade:

As a result of survey, there are some complaints on the job grade in each section. There are some special reasons for the problem. Judging from age and years of experience, there is considerable difference in job grade between Operation Section and the other sections. It is said that this causes demoralization.

According to NAPOCOR's planning, the existing organization will be improved. This will be also used for up-grading the discipline.

e. Personnel Rotation:

It seems that personnel are unevenly assigned to some sections. It seems to be difficult to adopt this recommendation, but personnel rotation, including persons holding administrative positions, should be performed for up-grading the technical level and discipline.

Fig. 4-4A THERMAL PLANT PERSONNEL IN JAPAN

A - ELECTRIC POWER COMPANY

		A1-P/P	A2-P/P	
		500MW x 2	156MW x 1 375MW x 1 500MW x 1	
Plant Facilities				
Plant Manager - 1 Asst. Plant Manager - 2	Administration Section (Sec. Chief-1)	Administration/Labor (Asst. Chief - 1)	9	11
		Finance/Procurement (Asst. Chief - 1)	5	5
		Fuel Management (Asst. Chief - 1)	3	3
	Technical Section (Sec. Chief-1)	Technical (Asst. Chief - 1)	5	6
		Chemical (Asst. Chief - 1)	4	5
	Operation Section (Sec. Chief-1)	(Asst. Chief - 4)	32	40
	Maintenance Section (Sec. Chief-1)	Electrical (Asst. Chief - 1)	3	3
		Control (Asst. Chief - 1)	8	7
		Mechanical (Asst. Chief - 1)	6	7
	TOTAL -----		94	106

Fig. 4-4B THERMAL PLANT PERSONNEL IN JAPAN

B - ELECTRICAL POWER COMPANY

		Plant Facilities	B-1 P/P 450 MW x 2	B-2 P/P 450 MW x 2 600 MW x 2	
Plant Manager - 1 Asst. Plant Manager - 2	Administration (Sec. Chief-1)		12	27	
	Technical Section (Sec. Chief-1)	Research	7	10	
		Instrument	9	15	
		Chemical	6	11	
	Operation Section (Sec. Chief-1)	Operation	40	76	
		Business	1	11	
	Maintenance Section (Sec. Chief-1)	Electrical	7	11	
		Mechanical	16	26	
			TOTAL --	113	194

Table 4-1 COMPARISON OF JOB GRADE

Job Grade	Maintenance	Operation	Technical Services
20	Mechanical Maint. Supt. A (1) Elect. Maint. Supt. A (1)	Optn Prin Engr B (10)	Tech. Serv. Supt A (2)
19	Mech Maint. Supervisor (2) Elect. Maint. Supervisor (1)		Prin. Tech. Anal. (4)
18			
17		Sr. Cont. Engr/Optr B (20)	
16	Sr. Maint. Engr/Foreman (3) Sr. Elect. Engr/Foreman (3)		
15		Sr. Cont. Engr/Optr A (50)	Sr. Tech. Anal. B (9)
14		Sr. Equipt Optr. B (30)	Sr. Tech. Anal. A (5)
13			
12		Sr. Equipt Optr A (20)	Equipt./Control Tech B (20)
11	Sr. Machinist (2) Sr. Elect'n B(1) Sr. Mechanic B (4) Gen Supv. (1)	Control Operator C (10) Sr. Electrician B (5)	
10	Sr. Mechanic A (8) Sr. Electrician A (6)	Equipt. Optr. C (10)	
9	Mechanic B (9) Plant Electrician B (7)		
8			
7			
6			Equipt & Cont. Tech. A (6)

( ) Positions : GSTP

Table 4-2 SUBSIDIARY COMPANY'S PERSONNEL

AT SOME ELECTRIC POWER COMPANY IN JAPAN

<u>Office</u>	<u>Plant Facilities</u>	<u>Mech.</u>	<u>Elect.</u>	<u>Business</u>	<u>Total</u>	<u>Remarks</u>
A	75 MW x 1 156 MW x 2 220 MW x 1 375 MW x 1	16 (1)	9	3	29	( ) Manager & Asst. Manager
B	156 MW x 2 600 MW x 2	26 (1)	18	4	49	
C	156 MW x 2 250 MW x 1 375 MW x 1	15 (1)	16	2	33	
D	250 MW x 2	28 (2)	15	5	50	
E	250 MW x 2	14 (1)	8		23	
F	Geo: 12 MW x 1 55 MW x 1	11 (1)	5		17	
G	500 MW x 2	22 (1)	21	4	48	
H	156 MW x 3 175 MW x 1	27 (1)	22	3	53	
I	156 MW x 1 375 MW x 1 500 MW x 1	26	17	3	46	
J	66 MW x 1 156 MW x 1	16	8	3	27	
K	375 MW x 1 500 MW x 1	22 (1)	16	3	42	
L	500 MW x 1	18	14	2	34	



Fig. 4-5 ORGANIZATION OF NAPOCOR

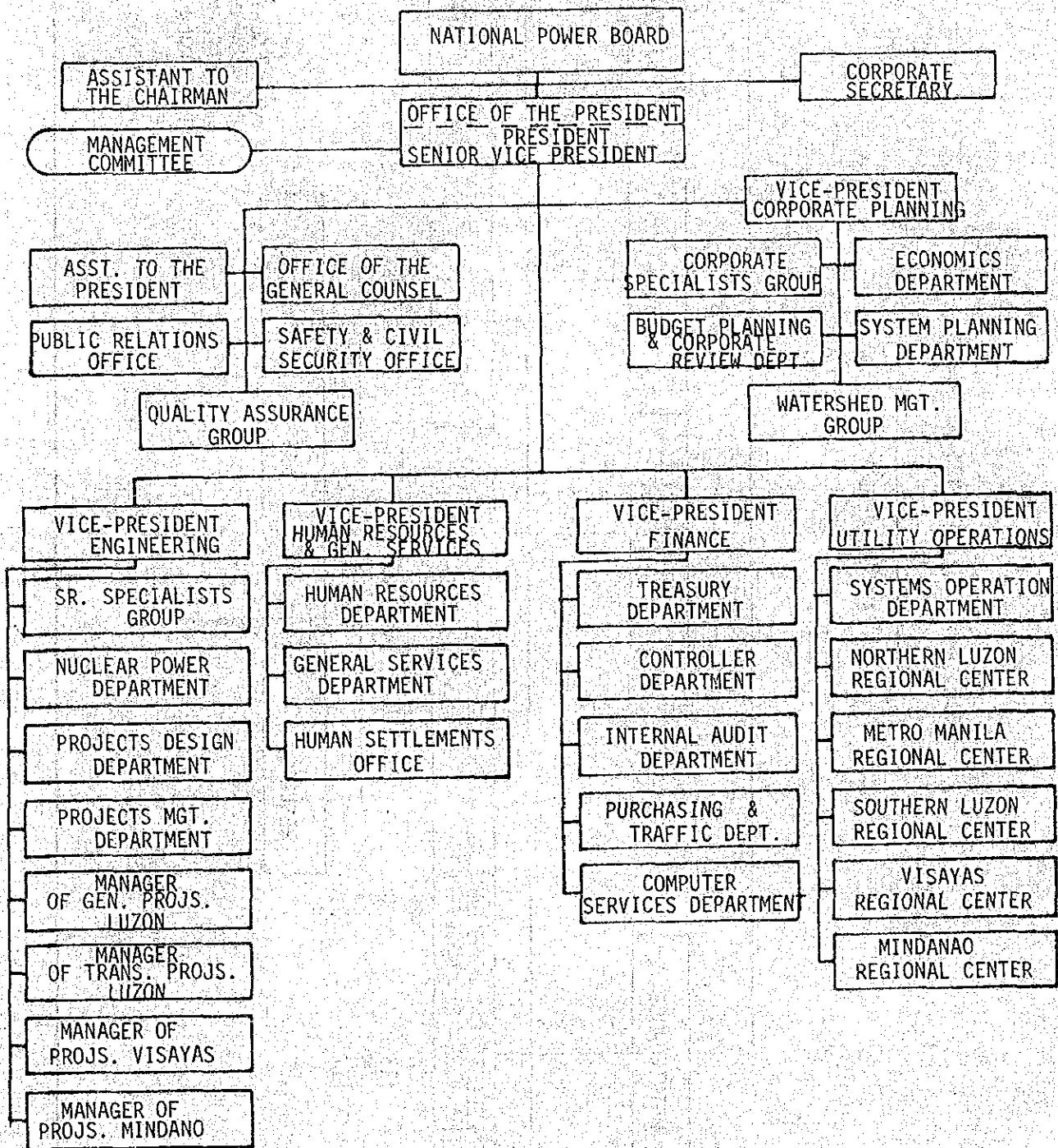
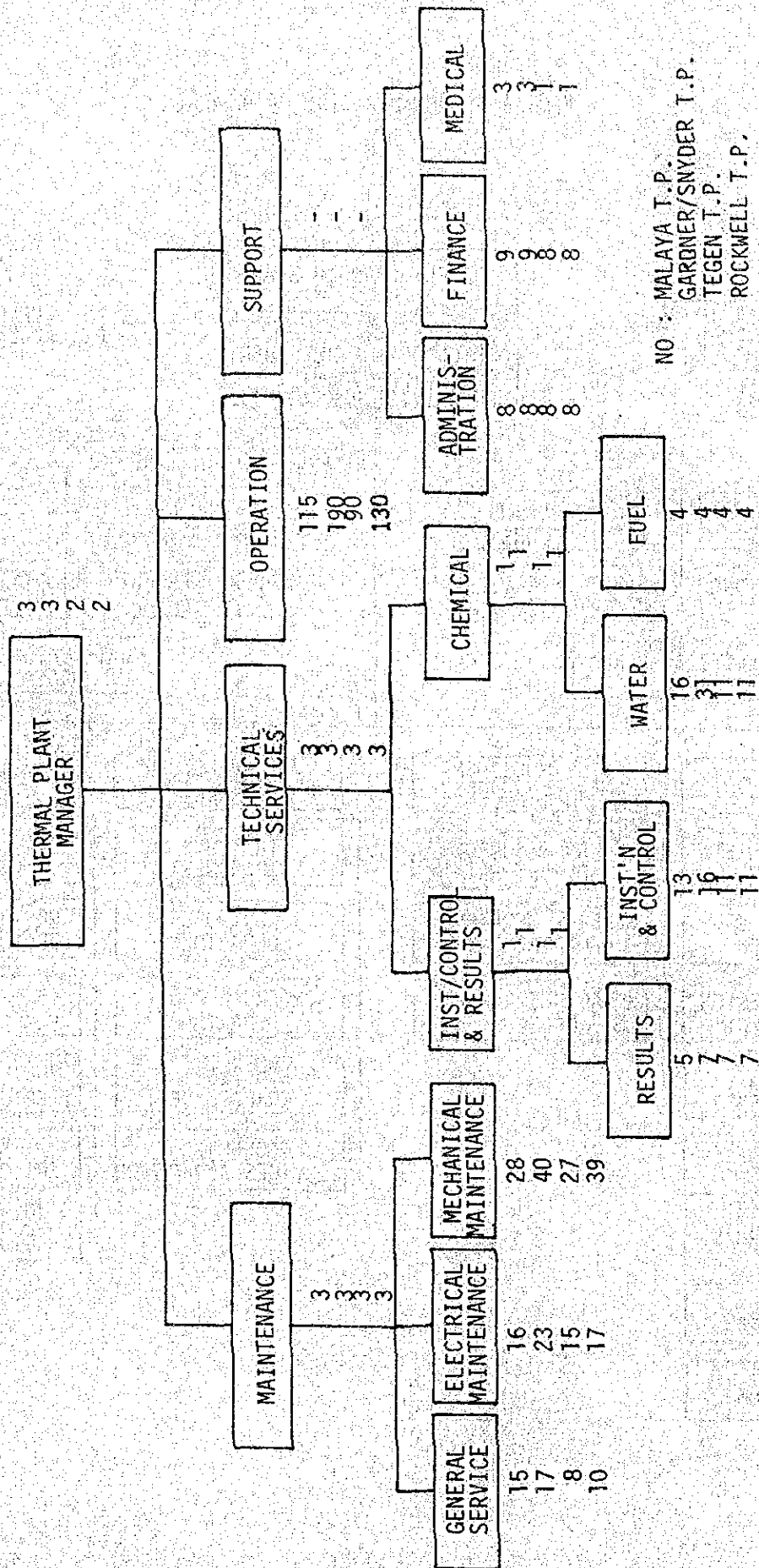


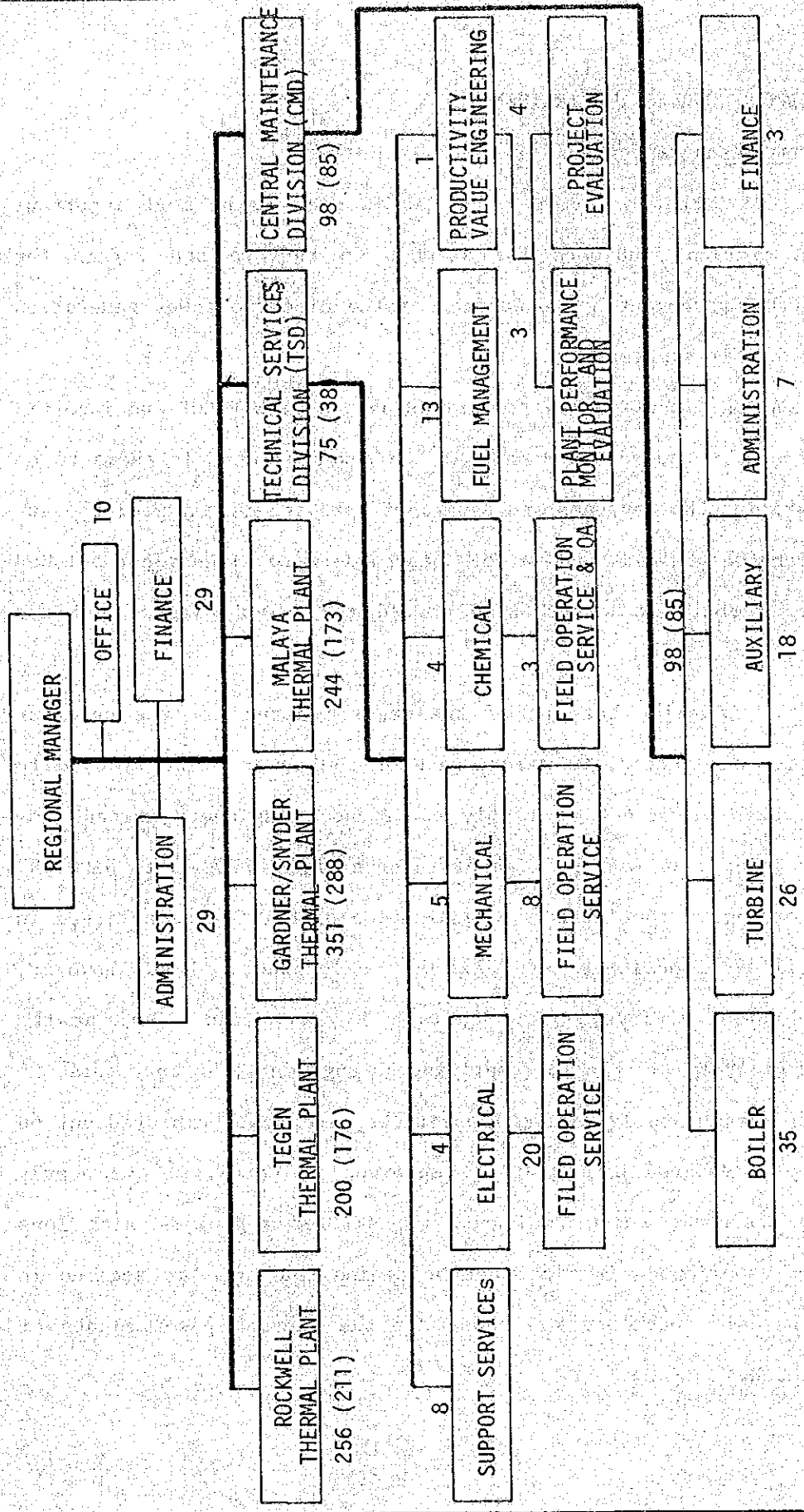
Fig. 4-6 T.O. OF THERMAL PLANT



NO : MALAYA T.P.  
 GARDNER/SNYDER T.P.  
 TEGEN T.P.  
 ROCKWELL T.P.

AS of Jan. 1980

Fig. 4-7 T.O. OF M.M.R.C.



NO : POSITIONS  
 ( ): Filled  
 AS of Jan. 1980

## 4.2 HUMAN RESOURCES AND TRAINING

### 4.2.1 Human Resources:

The matter of human resources is one of the most important and critical subjects for NAPOCOR to restore and retain the stable management and operation of the electric power generation and supply systems.

Among discussions with various people of NAPOCOR and investigations on the recorded data at the power plants, it seems to be clarified that systems and equipment were relatively well operated and maintained, and various standards were already established during the time when MERALCO owned the power plants in Metro Manila.

It is said that one of the major reasons for the deterioration and incomplete maintenance of the power plants is due to too much drain out of highly experienced engineers abroad from the power plant at the time of turnover from MERALCO to NAPOCOR. According to the Table of Organization of NAPOCOR established in April 1981, positions of 1,292 were allocated in MMRC, however, the actual employees were 988 with 304 vacancies. But, at the end of 1981, 190 people comprising 30 engineers, 94 operators, 54 technicians and 12 clerical positions were newly employed but 60 people resigned giving 1,118 employees in total. Since nearly 200 resigned, these resignees are skilled engineers with long time experience, it might not be denied that drastic decline in technical capability was caused at the thermal power plants of NAPOCOR.

Table 4-3 NUMBER OF SEPARATED EMPLOYEES OF MMRC (Persons)

	1978	1979	1980	1981	1982 1/4	Total
	1	64	47	60	13	185

Table 4-4 METRO MANILA REGION MANPOWER

Station	Approved T.O. Positions	Manpower Complement		Increase	Hirees Made		Resignations Made	
	1981	1981	1980		1981	1980	1981	1982
TSD	75	39	38	1	4	2	1	2
CMD	98	91	85	6	8	4	1	-
TEGEN	200	182	166	16	26	6	8	6
ROCKWELL	256	218	211	7	47	5	16	8
MALAYA	244	209	173	36	34	9	14	14
GSTP	351	327	288	39	66	22	20	17
OTHERS								
TOTAL	<u>1292</u>	<u>1118</u>	<u>988</u>	<u>130</u>	<u>190</u>	<u>51</u>	<u>60</u>	<u>47</u>

It can easily be anticipated that much difficulty would happen in the power plant operations by the decline in the technical capabilities of the power plant personnel because of the relatively frequent troubles recorded during the MERALCO time. Number of new employment is being planned so as to compensate this deficit of personnel, however, it takes a long time to train these new employees up to high level of technology and skill. This personnel scarceness in the Technical Services Division and Maintenance Group at power plants which are mainly involved in engineering works, is remarkable.

Ordinary hiring, education and training process of plant personnel, currently adopted in NAPOCOR, are set forth as follows:

1) Hiring of New Operator

Hiring of new employees is done at MMRC and/or NAPOCOR head office in accordance with the original request prepared by each plant.

2) Step of the Promotion

- a. Start the steps from "Operation Trainee" for 4 - 6 month.
- b. After this, assign to "Equipment Operator C" (Attendant facility/equipment patrol, data collect) for approximately 1 year\*
- c. Then step up into "Sr. Equipment Operator B" (Basement area auxiliaries) and stay in the position for approximately 1 year\*
- d. Then step up into "Sr. Equipment Operator A or B" (Boiler or Turbine area) and stay in the position for approximately 2 years\*

e. Then step into "Sr. Control Engineer/Operator A" and stay in the position for approximately 2 years\*

f. Finally step up into "Sr. Control Engineer/Operator B"  
(\*In case there is vacancy in the upper post)

It must be noted, however, that much attention should be paid to the increase in complement since there is a possibility to cause demoralization of plant personnels because of the reduction in their work as the power plant operation and maintenance works have some level of ceiling. Therefore, it is necessary to grasp the detail of works and its volume to be allocated to new employees.

In parallel with the new employment of personnels, upgrading system below mentioned of skills and technical competence of existing plant personnels are also needed:

- i. Re-training (Following Subchapter 4.2.2)
- ii. Instruction on the works by managers.

Since there exists much difference in the social circumstances, examples in the foreign countries are not always directly applicable so far as organizations are concerned, however, it is necessary that all works should be reported to the responsible managers corresponding to their level of importance and should be carried out under their instructions and understanding.

Especially for start-up/stop works and special works of the plant, it is desirable that such works will be done under the instruction and/or at the presence of responsible and authorized managers.

At the same time, careful and sufficient attention must

be paid so that such instructions will promote the personnel's morale, and not to hamper their satisfaction and self-confidence for their performance so as to avoid their over-reliance and unreliable attitude to the managers.

### iii. Personnel Rotation in the Plants

Reinforcement of the maintenance section of mechanical and instrumentation/control in the plant, which is deemed to have lack of engineers, will be recommendable by personnel rotation from other plant divisions.

Although it seems that no division in the plant has more personnels than they need, instrument and control maintenance section, especially, has nearly lost its function and urgent supplement of engineers is necessary.

### iv. Upkeeping and Arrangement of Manuals and Drawings

It might be said that the drastic decline in technical capability of the power plant personnels will not happen by the drain out of employees as far as past technical record and data are properly kept and managed by some means. It was found that no operation manuals and drawings were in the central control room of the existing power stations and no repair record of equipment in the maintenance section in some power stations.

This fact shows that operators are doing their works relying on their technical know-how not on the written procedures. All these manuals and records should be well arranged and maintained so as to preserve the accumulated technologies even if the plant personnel resigns or are rotated.