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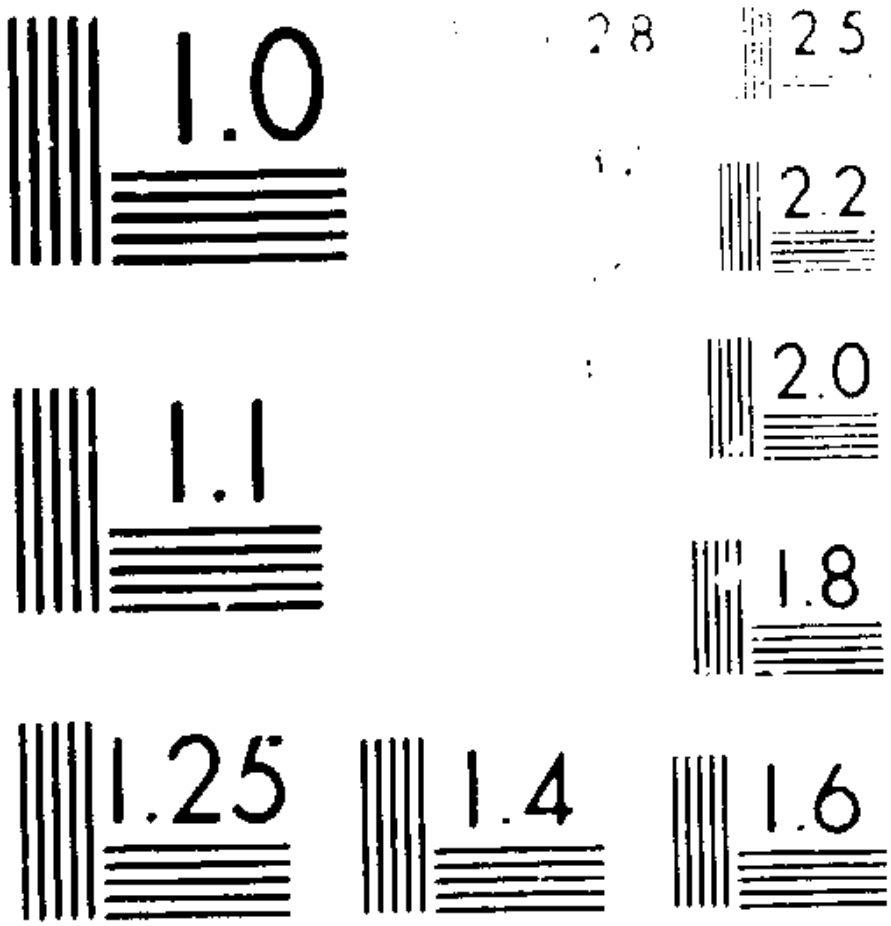
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BHARAT HEAVY ELECTRICALS LIMITED

(B H E L)

A CASE STUDY*

by

V. Krishnamurthy**

* The views expressed in this paper are those of the author and do not necessarily reflect the views of the secretariat of UNIDO. This document has been reproduced without formal editing.

** UNIDO consultant.

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CONTENTS

PROLOGUE

In my fairly long professional career, the period I spent in BHEL stands out as a period of intense activity, deep personal satisfaction and lasting impact. Not only did that period mould me as a manager, it also helped me, with a large number of other colleagues, to forge a corporate entity - BHEL. From a loose conglomeration of four manufacturing plants and a coordinating headquarters - emerged, slowly but securely, a corporation - that could stand up to its contemporaries elsewhere in the world - that played the game of business in high technology remarkably well in India and the International Arena.

The process unleashed hidden energy and talent in hundreds of executives - young and old - thousands of workers - skilled and unskilled. An organisation got moving. Things were planned. No wonder, they happened. The greatest satisfaction was in communicating this mood of adventure to a large number of dynamic, avid and vibrant young individuals in all spheres of the Company's activities. It happened mostly in encounters -- when they came to seek guidance and solutions to their problems, as individuals and in groups, in seminars and courses, in national forums ..... But the attempt was mostly verbal.

.../.

The desire to put a part of this story in a more formal document was always there - somewhere brushed to the side - deeply buried.

I am, therefore, thankful to UNIDO for making me put down some of these experiences in the form of a Case Study. To me, it has been a rewarding experience to traverse once again through the years. I do hope the participants, too, will find it a useful document and gain a good insight into the working of Indian Public Sector.

PREFACE

The BHEL Case Study has been presented in three parts. Part I, 'Genesis and Growth of BHEL' presents facts and figures relating to how BHEL was born and grew over the years. This part may be referred to for all data pertaining to BHEL and excerpts from the National Plans and Policy documents.

Part II, 'Evolution of Planning in BHEL' focuses on the changing complexion of planning activity in BHEL as it grew from the initial project stage to the highly diversified multi-product business which it is today. Emphasis in this part is to show how the planning process was evolved out of a felt need by the organisation, how it was linked to the National planning process, what are its components and how it has contributed in BHEL's achievements.

Part III, 'BHEL - The Public Sector Enterprise and Management of its 'Interlinkages' with the Environment' takes a look at BHEL as a public sector enterprise. It attempts to distinguish between the 'public sector' role and the 'enterprise' role of BHEL. As a public sector, BHEL is inextricably linked with the Government and its various economic agencies. This part presents how these interlinkages were managed by BHEL.

.../.

For ease of presentation, each of the three parts has been organised to contain complete information on the specific subject. Certain amount of repetition has, therefore, been deliberately allowed in the overlapping areas.

P A R T - I

Genesis and Growth of BHEL

1.0 Planning in India

India is a planned economy. Immediately after Independence in 1947, India set about its gigantic task of building a Nation in a systematically planned manner. Planning Commission, India's highest planning body was created in 1950. It laid down the objectives and direction of growth, outlined the approach and policy framework for development, drew up the programmes and allocated the resources in the form of Five Year Plans. So far, six Five Year Plans and three Annual Plans have been prepared beginning 1950. First and Second Five Year Plans provide the macro-economic framework within which Public Sector in India, Heavy Electrical Industry in India, and Bharat Heavy Electricals Limited (BHEL) were born.

.../.

1.1 Approach to Development

1.1.1 The early approach to development adopted in the planning process was outlined in the First Five Year Plan (1951-56). It states :

Quote

> The central objective of planning in India at the present stage is to initiate a process of development which will raise living standards and open out to the people new opportunities for a richer and more varied life. The problem of development of an under developed economy is one of utilising more effectively the potential resources available to the community, and it is this which involves economic planning. But the economic condition of a country at any given time is a product of the broader social environment, and economic planning has to be viewed as an integral part of a wider process aiming not merely at the development of resources in a narrow technical sense, but at the development of human faculties and the building up of an institutional framework adequate to the needs and aspirations of the people.

Unquote

1.1.2 The Second Five Year Plan (1956-61) can be termed as the "take-off" point for the Indian Economy. Much of the development, today, has its roots in this Plan. By the time this Plan was being formulated, Indian economists had firmed up their approach to development based on the concept of 'material balance'. It was outlined in the Plan thus :

Quote

> Planning for development involves a judgment, however limited and tentative, of how disposition of real resources within the community has to be and can best be altered so as to give the results desired. This way of looking at the problem in terms of real resources -- sometimes termed physical planning -- is an attempt to work out the implications of the development effort in terms of factor allocations and product yields so as to maximise incomes and employment.

.../.

The point is that while working out a programme, that is, its costs and benefits, it is necessary to look behind the financial or monetary 'veil' and to assess the implications or significance of the programme in real terms, that is, in terms of the reactions it will have on supplies and demands in at least the strategic sectors of the system. Behind an estimate of, say, Rs.1000 millions by a project authority, the demand really is for so much machinery, so much building material, so much labour, etc. The question is not merely one of how the finance is to be raised -- although that is an important question -- but whether and how the real resources of the kind just mentioned have to be obtained. Similarly, when the project is completed, the question is how its benefits will be utilised and what types of demands this will satisfy and in turn create; plans for the latter may also have to be laid out in good time if resources are not to run to waste. What is more, the mobilisation of real resources has to be viewed in the light of the programme of development as a whole and not merely in relation to individual projects. To this end, the way

demands for inputs rise in various related lines in response to a planned increase in outputs at particular points has to be studied.

There have to be, in other words, certain balances in the plan in terms of real resources. A plan unfolds itself in first upsetting an existing balance and then establishing a new one at a higher level. One has to ask: will the supplies of the machinery needed be forthcoming? Will the necessary labour, skilled and managerial, be available? Will it be necessary to secure some of the equipment from abroad and if so, will the community be in a position to export the additional amounts required to pay for the same? Will employment opportunities on the required scale be created and will the sum-total of all effort yield the results expected in terms of national income? To an extent, a plan worked out in terms of real resources can provide for the necessary balances through the pattern of investment to be adopted, and where this cannot be done, the bottlenecks to be faced and overcome can be concretely envisaged. The tasks of training the large number of technicians and other experts can hardly be conceived in any other terms.

.../.

It must be emphasised that the balance to be achieved in the Plan has to be both in real and financial terms. Money incomes are generated in the process of production, and supplies are utilised in response to money demands. It is important, therefore, to operate upon and modify money income flows so as to maintain a balance between the supply of consumer goods and the purchasing power available for being spent on them, between savings and investment and between receipts and payments abroad. In addition, a balance between the demand and supply of each important commodity is necessary. The required balances may, of course, be achieved in part through adjustment in prices and factor payments, through budgetary policies -- and, if necessary, through physical controls; but the process as well as the means of adjustment have to be visualised in advance and have to be provided for in the plan."

Unquote

.../.

1.1.3 In addition, the Second Five Year Plan laid the foundation for an approach to industrialisation. It states :

Quote

> Countries which start late on their industrial career have some advantage in that they have, in the main, to take over and apply techniques that have been worked successfully in more advanced countries. But, there is need simultaneously for keeping abreast of the latest developments in science and technology, if the time lag in economic advance is to be progressively narrowed. The search for new resources and for new techniques and the readaptation of the available labour force to the new tasks which development connotes are indeed the foundation of development.

Unquote

1.2 Genesis of Public Sector in India

1.2.1 Right from the start the national planners were conscious of the role which the State could play in the industrial development of the country. The respective roles of the State and of private enterprise has been enunciated in the Industrial Policy Resolution of 1948. In terms of this resolution :

Quote

> the principle of Government ownership and control has been accepted in regard to a segment of the economy comprising arms and ammunition, atomic energy and railways. It has also been stated that in regard to certain key industries like coal, iron and steel, aircraft manufacture, ship-building, manufacture of telephone, telegraph and wireless apparatus, etc., the State is to be responsible for further expansion except to the extent that it considers the cooperation of private enterprise necessary for the purpose. In the rest of the industrial field the initiative for development and the responsibility for management will rest on private enterprise. Government have, however, the right to acquire any undertaking in the public interest and to intervene in cases where the conduct of industry under private enterprise is not satisfactory.

Unquote

1.2.2 Public Sector, as it exists in India today, was conceived in the Second Five Year Plan. The concept was outlined in the Industrial Policy Resolution (1956) as contained in the Second Five Year Plan. It states

Quote

"The adoption of the socialist pattern of society as the national objective, as well as the need for planned and rapid development, require that all industries of basic and strategic importance, or in the nature of public utility services, should be in the public sector. Other industries which are essential and require investment on a scale which only the State, in present circumstances, could provide, have also to be in the public sector. The State has therefore to assume an increasing responsibility for the future development of industries over a wider area. Nevertheless, there are limiting factors which make it necessary at this stage for the State to define the field in which it will undertake sole responsibility for further development, and to make a selection of industries in the development of which it will play a dominant role. After considering

.../.

all aspects of the problem, in consultation with the Planning Commission, the Government of India have decided to classify industries into three categories, having regard to the part which the State would play in each of them. These categories will inevitably overlap to some extent and too great a rigidity might defeat the purpose in view. But the basic principles and objectives have always to be kept in view and the general directions hereafter referred to followed. It should also be remembered that it is always open to the State to undertake any type of industrial production.

In the first category will be industries the future development of which will be the exclusive responsibility of the State. The second category will consist of industries, which will be progressively State-owned and in which the State will therefore generally take the initiative in establishing new undertakings, but in which private enterprise will also be expected to supplement the effort of the State. The third category will include all the remaining industries, and their future development will, in general, be left to the initiative and enterprise of the private sector.

Unquote

.../.

1.2.3 The Heavy electrical plant which includes large hydraulic and steam turbines was listed in the first category -- industries the future development of which would be the exclusive responsibility of the State.

1.3 Genesis of Electrical Equipment Industry in India

1.3.1 The important role of electric power in the development of the country was seen and outlined in the First Five Year Plan (1951-56) itself. It states :

Quote

> Cheap electric power is essential for the development of a country. In fact, modern life depends so largely on the use of electricity that the quantity of electricity used per capita in a country is an index of its material development and of the standard of living attained in it. Apart from its use in industrial undertakings, electricity has a remarkable diversity of application. Electricity can provide cheap power for pumping water for irrigation and for numerous operations in agriculture and in the home. Extensive use of electricity can bring about the much needed change in rural life in India. It can not only improve methods of production in agriculture and encourage cottage and small scale industries but can also make life in rural areas much more attractive and thus help in arresting the influx of rural population into cities.

.../.

The use of electricity in India is very limited at present. The average per capita consumption of electricity is only 14 kWh per year (as compared with 1100 kWh in the United Kingdom. 2207 kWh in the United States of America and 5905 kWh in Canada) and in a number of States the average is below one unit per year (1950 statistics). Only five States have a per capita consumption higher than the average mentioned above for the country as a whole.

Unquote

1.3.2 The Second Five Year Plan (1956-61) further emphasised the importance of power and outlined the programme for future development. It states :

Quote

Planning for power projects is a continuous process and has to be based on long-term objectives. At the time of formulation of the first plan, the 15-year target for additional power capacity was set at 7 million kW. In view of the progress which has been made and the growing demand for power from industry, small towns and rural areas, this target has to be revised upwards. So far as can be ascertained at the present time, for the second and third plans, it will be necessary

.../.

to set forth, as an objective of planning, a rate of increase of about 20 per cent annually in the installed capacity of public utility undertaking. On this basis, the tentative target for 1965 would be to raise the total installed capacity in the country to about 15 million kW. In the nature of things a target such as this cannot be regarded as being rigid; adjustment will certainly be needed from time to time so as to take account of changes in the scope of industrial programmes, location of industrial units and the growth and pattern of consumption.

Unquote

1.3.3 In view of the above programme, the Plan considered the establishment of indigenous facilities for the manufacture of heavy electrical equipment. It states :

Quote

For the plant and machinery required for power projects, the country is largely dependent on imports. Only a few items of light electrical equipment such as transformers, small motors, conductors, wires, lamps, etc are being manufactured in the country. Even here the full needs are not being met. The annual imports of electrical equipment during the last two years is of the order of Rs.300 million, of which heavy electrical equipment alone was of the order of Rs.200 million per year.

.../.

During the second and the third plans the requirements of electrical equipment would increase substantially. It has, therefore, become a matter of urgency to create manufacturing capacity in the country. Accordingly, it has been decided to establish a factory for manufacturing heavy electrical equipment such as hydraulic turbines, alternators, motors, transformers, switchgear etc. Preliminary work on this project is now in progress. It is expected that the factory will go into production in 1961 and meet a part of the country's requirements thereafter."

Unquote

.../.

2.0 Growth of Bharat Heavy Electricals Limited (BHEL)

2.1 Keeping in mind the growing power needs of the country, the Government in 1955 set up a plant in the Public Sector for the manufacture of heavy electrical equipment at Bhopal. The decision to embark on such a project was the first concrete step in the direction of self-reliance. This factory went into partial production in November 1960. Today, it turns out an entire range of power equipment viz thermal turbo-sets, hydro-sets, marine turbines, turbines for nuclear power stations, power transformers, switchgear, industrial and traction motors, control equipment, rectifiers, capacitors etc. It has a capacity to deliver annually 500 MW of hydro-sets, 600 MW of thermal turbo-sets and 4000 MVA of power transformers and several other products.

2.2 Subsequent studies undertaken at the time of formulation of the Third Five-Year Plan (1960) revealed that it would not be possible for the Bhopal Plant alone to meet the entire demand of power generating equipment in the country. The government, therefore, decided to set up additional plants at Hyderabad and Hardwar.

.../.

Hyderabad plant which was to be set up with Czech collaboration envisaged manufacture of steam turbines and boilers. Subsequently, it was decided to locate the manufacture of boilers separately at Tiruchirapalli.

The management of these undertakings was entrusted to a new Corporation in the Public Sector called the Bharat Heavy Electricals Limited which came into being in November 1964. The High Pressure Boiler Plant at Tiruchi was the first to go into production in May 1965, closely followed by the Heavy Power Equipment Plant at Hyderabad in December 1965. The Heavy Electrical Equipment Plant at Hardwar went into production in January 1967.

2.3 The steps involved in National Planning in setting up the Heavy Electrical Industry in India are briefly recounted below.

- The scope of an industry of this nature was first discussed by

  a. The Advisory Plan ing Board (December 1946)
  b. The Technical Committee on Engineering Industries of the Industrial Conference held in December, 1947.

- A committee was appointed, headed by Dr J.C. Ghosh (the then Director General of Industries and Supplies) to explore the possibility of developing the manufacture of Heavy Electrical Power Plant to meet the requirements of the generation, transmission and distribution of power in the country.

- The committee recommended that a factory be immediately set up as a Government project in collaboration with foreign manufacturers of international repute.

- Based on the committee's recommendations, detailed project reports were invited from well-known firms in Uk and USA.

.../.

- After extensive surveys had been carried out by their representatives, three firms viz Associated Electrical Industries, UK; International General Electric Co., UK; and Westinghouse of USA submitted project reports to the Ministry of Industry and Supply.

- The explanatory committee recommended the establishment of a factory for the manufacture of 1,75,000 KW of plant per year (approximate value Rs.175 millions).

- M/s Westinghouse showed willingness to participate financially by way of a loan extending over a number of years.

- Further consideration of the project was deferred in 1950 owing to the prevailing financial stringency.

- The issue was revived again because of the increasing need for hydro-electric development schemes and large scale electrification of Railways. Ministry of Production took up the issue with the Planning Commission in August 1952.

- A sum of Rs.70 million was provided for the project in the First Five-Year Plan.

.../.

. Project reports with technical as well as financial participation were invited.

. Two international firms submitted the reports in 1954.

. Before taking a final decision, the Government again constituted a committee headed by Shri S.A. Gadkary, Consultant (Power), Planning Commission to investigate :

i. the exact requirements by the country of heavy electrical equipment

ii. the extent to which these could be met by utilising the excess capacity in the existing plants and workshops

iii. the residue of the requirements left to be covered, and

iv. how this residue ought to be met speedily and economically and through what agency.

. In its report submitted in January 1955, the Gadkary Committee observed as follows :

.../.

Quote

i. The existing production in India has been examined as also its possible expansion in the near future. Production is mostly confined to small transformers and motors. The Committee finds that no heavy plant is being planned by the existing units. Nor is there any unused capacity suitable for this purpose in the Government workshops and factories.

ii. The Committee is of the firm conviction that the manufacture of heavy electrical plant in the country is essential for speeding up industrialisation and that the only way of achieving it is for the state to establish a factory for the purpose.

Unquote

. The Government accepted the recommendations of the Gadkary Committee.

. After a study Bhopal was chosen for locating the first integrated heavy electrical plant, and Heavy Electrical (India) Ltd, Bhopal was thus born on August 29, 1956.

. Associated Electrical Industries of UK was selected as Consultant for the Project, under an agreement entered into on November 17, 1955.

. Bhopal Project implementation started in 1956.

.../.

- Even while the first plant was under construction, Government of India felt the need for setting up additional manufacturing capacity for equipment for Power Stations.

- Soviet Union and Czechoslovakia showed interest in the development of this industry by offering loans.

- Government appointed another committee under the chairmanship of Shri KB Mathur; the members included among others Dr. KB Rao and Shri Krishnamurthy to determine the product-mix for the new plants. With a view to dispersing the manufacturing centres, Government decided to set up the plant with Soviet collaboration in Northern India and those with Czech collaboration in Southern part of India.

  i. Heavy Electrical Equipment Plant at Hardwar with Soviet Collaboration

  ii. Heavy Power Equipment Plant at Hyderabad with Czech Collaboration

  iii. High Pressure Boiler Plant at Tiruchirapalli with Czech Collaboration

- Production in Bhopal plant, inaugurated by the Prime Minister of India in 1960. Manufacture of transformers, switchgear and traction machines commenced. Because of paucity of funds, the plant was implemented in stages.

- The three new units were separated from HE(I)L to form a new company, BHEL which was incorporated in November 1964.
- Tiruchi goes into production in May 1965 ; Hyderabad unit in December 1965; and Hardwar in January 1967. Except Tiruchi, the two other plants showed low growth. Bhopal incurred heavy losses.
- An Action Committee appointed by Government in 1971 to go into the working of Public Sector Enterprises, studied the working of HE(I)L and BHEL, suggested extensive managerial changes and recommended merger of the two companies.
- HE(I)L brought under the management of BHEL from July 1972.
- HE(I)L was merged into BHEL in April, 1973.

2.4 As envisaged in the Second Five-Year Plan, BHEL started somewhere in the middle of the normal evolutionary phase for such a company. The product-mix was selected by the Government, technical collaboration was obtained to import technology and implement the project, and the production was started with the help of the collaborator's experts. Table-I gives the Company profile at the start-up.

.../.

TABLE I

Company Profile at Start-up

Location	Collaborator	Products covered initially	Construction start-up	Production start-up
Bhopal	AEI, UK	Hydro-sets and auxiliaries, Motors, Switchgear, Transformers, Capacitors, Controlgear, Traction Equipment	1956	November 1960
Hardwar	Prommasch-export, USSR	Turbo-sets and auxiliaries, Hydro-sets and auxiliaries, Motors, Controlgear, Traction Equipment	October 1963	January 1967
Hyderabad	Skodaexport, CSSR	Turbo-sets and auxiliaries, Pumps	August 1963	December 1965
Tiruchi	Skodaexport, CSSR	Steam generators, Fans, Electro-static precipitators, Air Preheaters, Soot blowers, Valves	June 1963	May 1965

2.5 The landmarks in the growth of BHEL since its inception are summarised below.

2.5.1 1964-69

- Two more manufacturing units, Central Foundry Forge Plant (CFFP) at Hardwar and Switchgear unit at Hyderabad are conceived. Construction begins for the switchgear plant. Foundry Forge Plant is deferred.
- Hyderabad unit diversifies into turbo-blowers, turbo-compressors, drive turbines, power station pumps and minimum oil circuit breakers.
- A major emphasis is placed on technology transfer, indigenisation, training, etc.
- Decision taken to expand Tiruchi plant from 750 MW annual output to 1500 - 2000 MW per annum.
- Tiruchi plant takes jobbing work to utilise spare plant capacity.
- BHEL becomes a member of Indian Consortium for Power Projects (ICPP) for taking turnkey jobs in power projects.

.../.

2.5.2 1969-74

- BHEL becomes profitable
- Product-mix is enhanced to include nuclear TG sets and boilers, boiler house auxiliaries, heat exchangers, transformers, capacitors, industrial drive turbines and traction equipment.
- First export order is won by Tiruchi for 2 x 60 MW boiler from Malaysia (1969-70), repeat orders are received during 1970-71/1971-72.
- Order is received for 235 MW TG for Kalpakkam Atomic Power Plant.
- Further diversification is carried out at Hyderabad: New technology is obtained for centrifugal compressors from Nuovo Pignone, Italy.
- Tiruchi unit takes the first major step of changing its collaborator with a view to improving its operations. Technology is updated for boilers and boiler house auxiliaries at Tiruchi.

Product	Collaborator
Boilers	CE, USA
Air-preheater	CE - APCO, USA
Fans	KKK, West Germany
EPs	SF, Sweden

.../.

- A major emphasis is placed on ancillary development.
- BHEL wins an award for outstanding export performance.
- Commercial and design departments in the Company are reorganised.
- Decentralised administration is introduced at Unit level.
- New divisions are set up to strengthen customer service and engineering function
    - . Power Projects and Services
    - . Corporate R&D
- Chairman's Office is enlarged to become Corporate Office.
- Work commenced on a Corporate Plan.
- Total installed capacity (MW) upto 1973-74 rises to

    Country as a whole - 16,422

    of which BHEL share was - 910

.../.

2.5.3 1974-79

- Corporate Plan issued - A turning point for future growth.
- Corporate Plan implementation commenced
  - . Engineering reorganisation is taken up
  - . New divisions are set up
- Product-mix enhanced to include Thermal Systems, 500 MW TG sets and boilers, EPs, Pipes and fittings, control equipment devices, controlgear, hydro system, transmission and distribution system, insulators, energy meters, solar energy products, thermo-mechanical systems, seamless steel tubes and castings and forgings.
- BHEL diversifies into oil rigs.
- BHEL participates in national and international R&D projects
  - . Solar energy
  - . Coal programmes
  - . MHD

.../.

- Major growth in export activity includes

  . Biggest export order for India at that time for 2 x 120 MW Thermal Power Station at Tripoli, Libya

  . Wadi Jizan Electrification Project, Saudi Arabia

  . Hydro generators to New Zealand

  . Fifth consecutive order for 2 x 120 MW boilers from Malaysia

  . Industrial TG order from Tanzania

  . 3 x 30 MW hydro turbines from Thailand

  . 132 kV sub-station in Nepal

- Development receives a thrust

  . Fluidised Bed Boiler is developed

  . Solar Heating system is developed

  . Corporate quality assurance group is set up

.../.

- Technology is updated and modernised for large number of products.

Product	Collaboration
Valves	Dresser Inc., USA
Soot blowers	Copes Vulcan, USA
Industrial Drive Turbines	Siemens, West Germany
MOCBs	ASEA. Sweden
400 MW Transformers	Alsthom, France
Oil Rigs	USS Engineers, USA
Devices	Siemens, West Germany
Thyristor convertors	Siemens, West Germany
Excitation Equipment	BBC, Switzerland
HP, LP Bypass	Sulzers, Switzerland
Large steam turbines upto 1000 M	KWU, West Germany
On-load tap changes	MR, West Germany
Capacitors	GE, USA

- BHEL wipes out accumulated losses, annual profit before tax crosses Rs.600 million.

.../.

- Diversification and accelerated growth is achieved through acquisition and merger (with)
  - . Indian Consortium for Power Projects (ICPP)
  - . Radio Electricals Manufacturing Company (REMCO)
  - . Mysore Porcelains Limited (MPL)
- Further steps are taken to strengthen Corporate identity
  - . The introduction of Executive Director & Group General Manager (ED&GGM) to head the divisional operations in a dual role of planner and an implementor.
  - . Integrating devices viz. Executive Committee, Functional Committees, Product Committees, are introduced to bring a synthesis of highly differentiated operations at various levels.
  - . In-house Management Development Institute (MDI) is set up as a centre for growth of in-house management development capacity.

.../.

. Corporate Systems are developed and Company-wide computerisation is taken up. Large computer systems are established at all the major units.

. Thrust is given to raising planning capability in the organisation.

- Total installed capacity (MW) upto 1978-79 rises to

Country as a whole	- 26,031
of which BHEL's share was	- 9,688

2.5.4 Annexures I, II, III and IV give growth of product-mix, BHEL divisions overall operations, and organisation charts, respectively for above periods.

Annexure I

Energy Sector		1964-69	1969-74	1974-79
Thermal/Nuclear System				+
Thermal sets	30 MW	+	+	
(TG & boiler)	60 MW	+	+	+
	100 MW	+	+	
	110 MW	+	+	+
	120 MW		+	+
	210 MW		+	+
	500 MW			+
Nuclear sets	236 MW		+	+
Valves		+	+	+
Soot blowers			+	+
Fans			+	+
EPS				+
Pumps		+	+	+
Motors		+	+	+
Heat Exchangers			+	+
Pipes & Fittings				+
Hydel System				+
Hydro sets		+	+	+
Pump Turbines				
Micro Hydel Sets				
Bulb Turbines				
Transmission/Dist. System				+
Transformer			+	+
Switchgear		+	+	+
Capacitor			+	+
Insulator				+
Control Equipment				+
Devices				+
Controlgear				+
Energy Meters				+
Solar Energy Products				+

Annexure I (contd.)

Industry Sector	1964-69	1969-74	1974-79
Thermo-mechanical system			+
Industrial TG	+	+	+
Turbo-compressor	+	+	+
Centrifugal compressor		+	+
Drive turbines	+	+	+
HSDT			+
Industrial boilers	+	+	+
Valves	+	+	+
Pumps	+	+	+
Motors		+	+
Control equipment			+
Controlgear			+
Electric drives & control system			+
AC machines	+	+	+
DC machines	+	+	+
Oil rigs			+
Transportation sector			
Traction equipment			+
Control equipment			+
Controlgear			+
Others			
Gray iron castings	+	+	+
Seamless steel tubes			+
Steel castings			+
Free forgings			+

(+ indicates the existence of the particular product in the Company product-mix)

Annexure II

Growth of BHEL Divisions

Divisions	1964-69	1969-74	1974-79
HEEP, Hardwar	+		
HPEP, Hyderabad	+		
HPBP, Tiruchi	+		
HEIL, Bhopal	*		
CFFP, Hardwar			+
SSTP, Tiruchi			+
TF, Jhansi			+
CED, Bangalore			+
EPD, Bangalore			+
R&D		+	
PP&SD		+	
PED			+
ISG			+
TSG			+
MSD			+
ROD			+
Exports			+
OPD			+
MDI			+
Corporate Office		+	

(+ indicates period of setting up
* HEIL, Bhopal was set up in 1956.
It was merged with BHEL in 1973.)

Annexure III

Growth in Operations

(Rs. in millions)

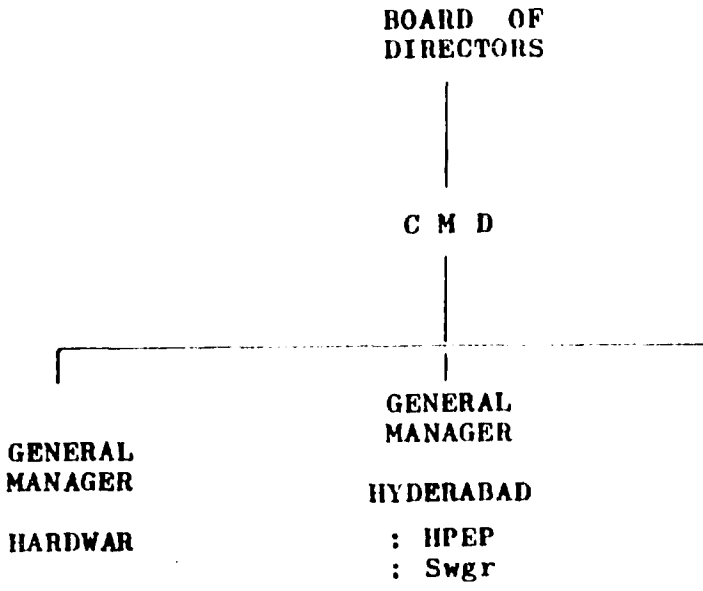
	1968-69	1972-73	1973-74	1978-79
Value of production, accretion to stocks	353.0	1,414.0	2,309.3	6,591.0
Other income	4.0	30.7	44.0	237.0
Materials	195.5	744.6	1,280.0	3,501.5
Salaries, wages and other benefits to employees	51.2	246.1	345.2	850.5
Depreciation	31.7	80.5	84.4	205.6
Interest	48.5	109.7	127.4	288.3
Manufacturing and other expenses	63.8	131.3	242.4	1,477.2
Profit (loss) before tax	(33.7)	132.5	273.9	504.9
Cumulative profit(loss) after reserves	(164.5)	(589.3)	(516.7)	0.3
Equity	650.0	1,300.0	1,300.0	1,300.0
Borrowings and deferred credits	1,043.1	1,943.7	2,290.8	3,259.0
Reserves & surplus	-	0.6	198.1	920.9
Current assets	643.6	2,838.3	4,006.9	9,015.1
Current liabilities	345.8	1,956.9	2,426.6	6,445.0
Net fixed assets	1,163.0	1,729.2	1,667.6	2,909.8
Orders on hand (gross)	1,407.0	7,048.0	9,635.0	20,000.0
Export performance	-	15.0	43.0	1,203.0
Number of employees	15,900	40,700	44,800	59,700
Capital investment (at the end of the year)	1,968.4	2,306.9	2,428.5	4,749.0

Annexure IV

Organisation Charts

ORGANISATION - BHEL

(1964-69)



BOARD OF
DIRECTORS

C M D

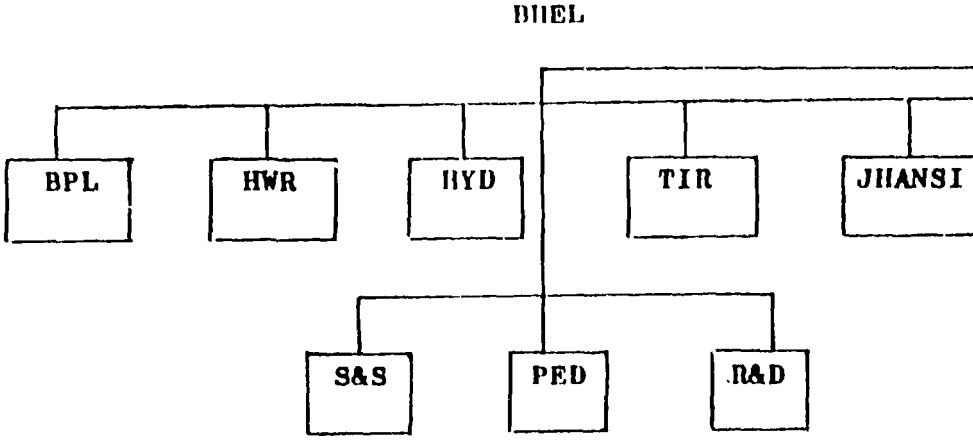
GENERAL
MANAGER

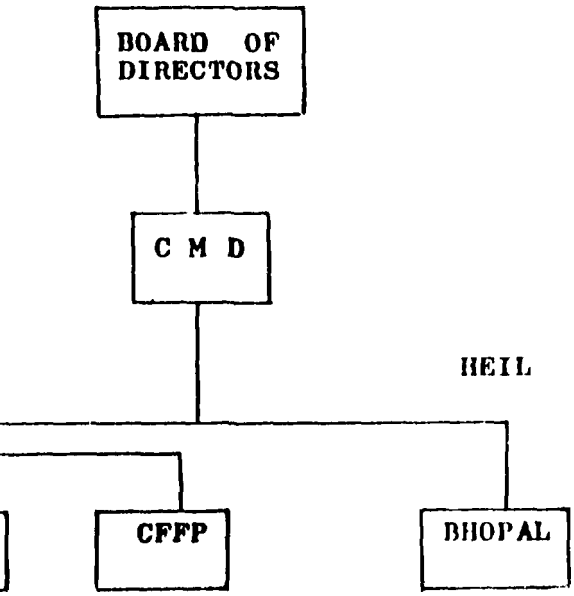
TIRUCHI

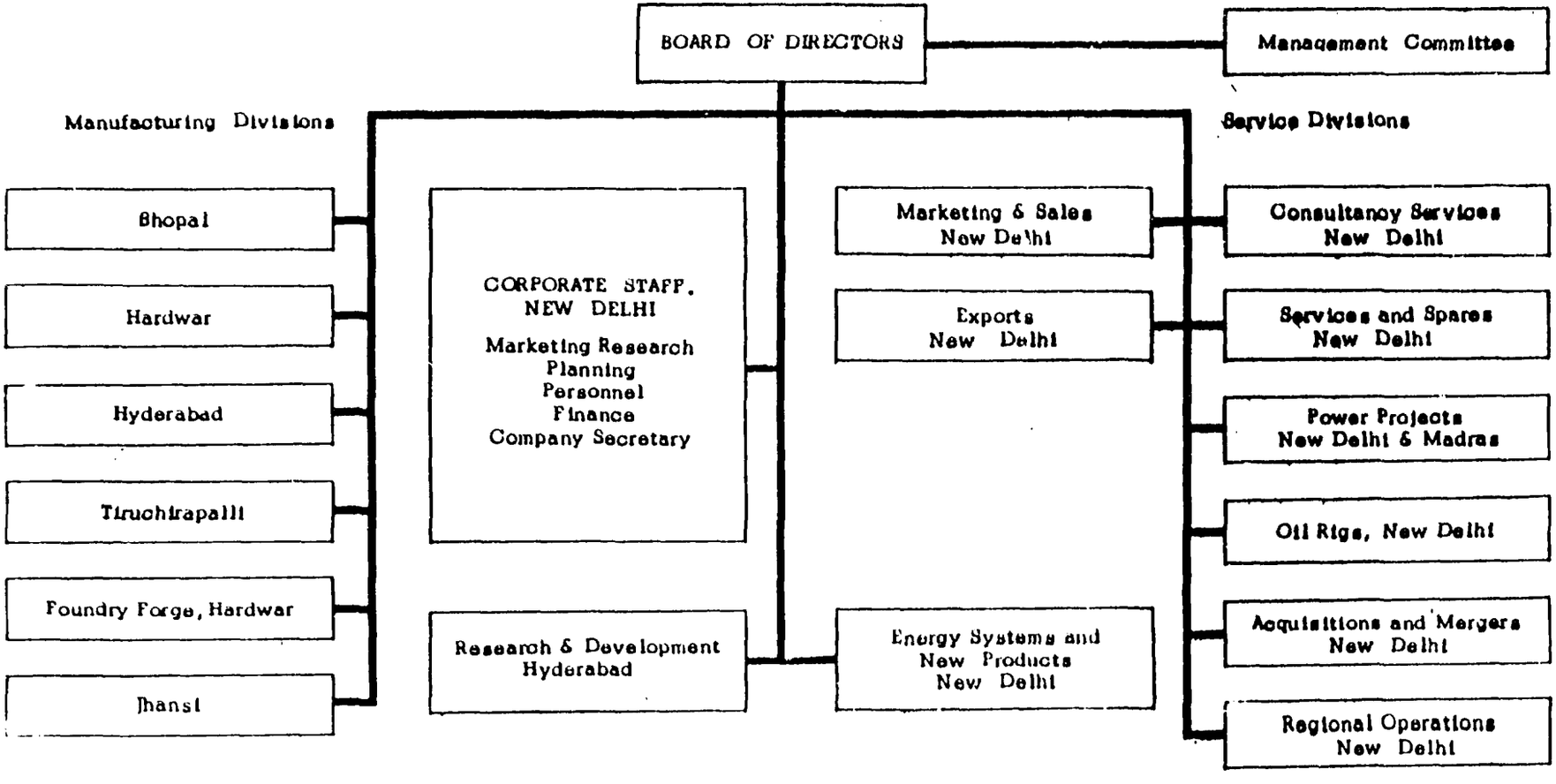
BHOPAL
OPERATIONS

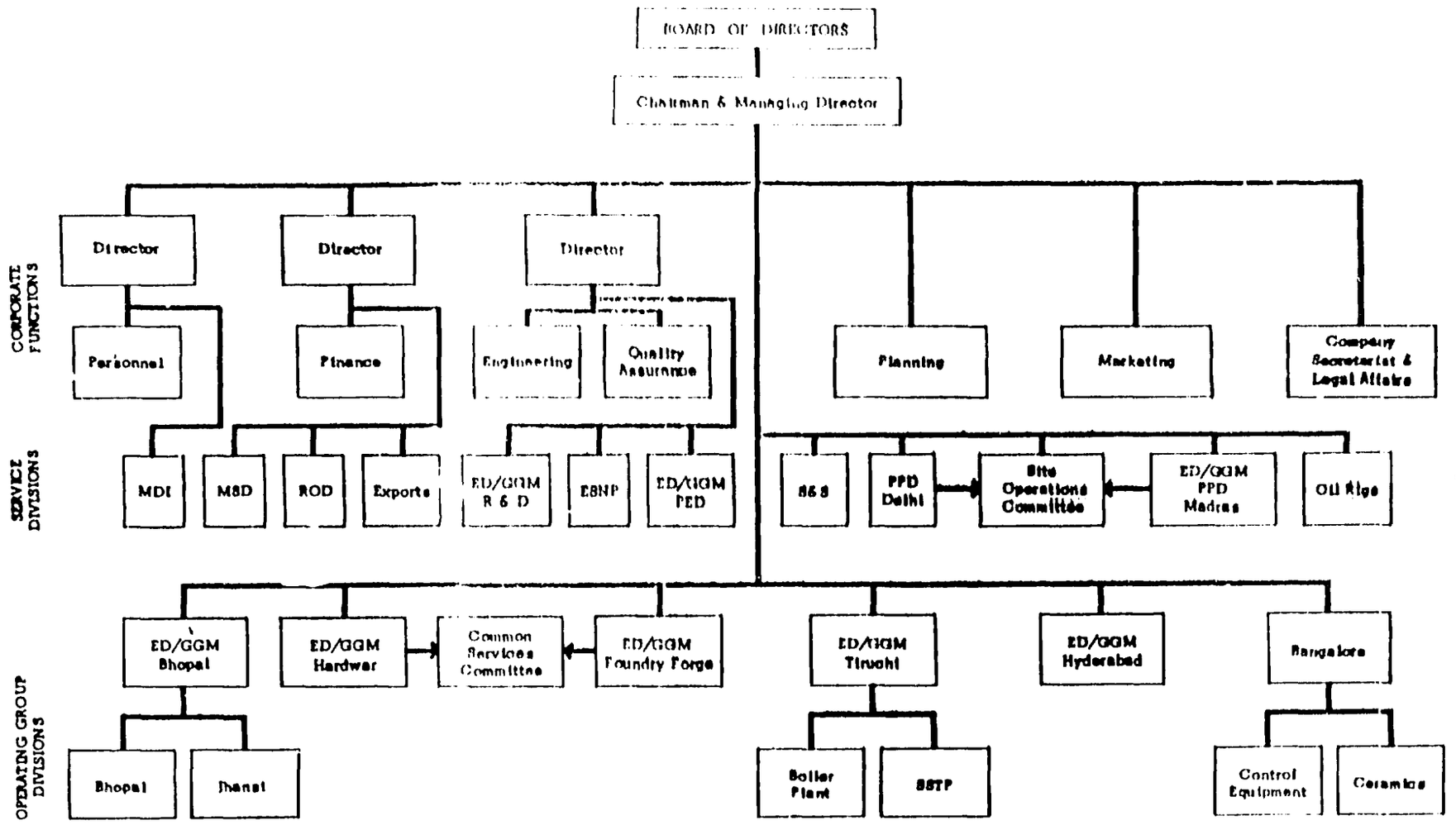
ORGANISATION - BHEL

(1973-74)




BOARD OF DIRECTORS
C M D
HEIL
CFFP
BHOPAL


BOARD OF DIRECTORS
Management Committee
Manufacturing Divisions
Service Divisions
Bhopal
Hardwar
Hyderabad
Tiruchirapalli
Foundry Forge, Hardwar
Jhansi
CORPORATE STAFF, NEW DELHI
Marketing Research
Planning
Personnel
Finance
Company Secretary
Research & Development Hyderabad
Marketing & Sales New Delhi
Exports New Delhi
Energy Systems and New Products New Delhi
Consultancy Services New Delhi
Services and Spares New Delhi
Power Projects New Delhi & Madras
Oil Rigs, New Delhi
Acquisitions and Mergers New Delhi
Regional Operations New Delhi



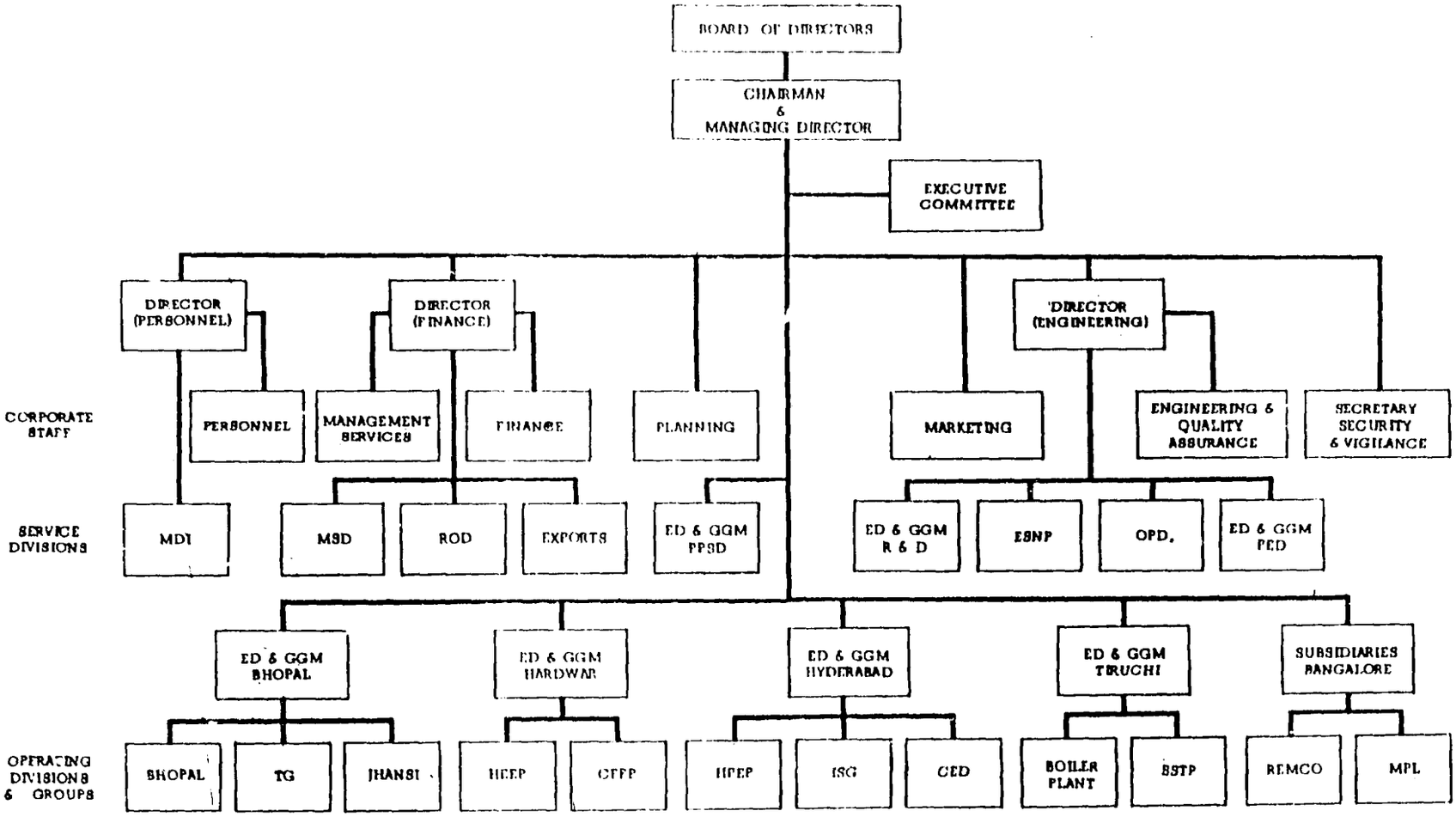
ED/GGM	Executive Director & Group General Manager
MDI	Management Development Institute
M&D	Marketing & Sales Division
ROD	Regional Operations Division
R & D	Research & Development

28-9-1976

EBNP	Energy Systems & New Products
PED	Project Engineering Division
S & S	Services & Spares
PPD	Power Projects Division
SSTP	Seamless Steel Tube Plant

BHARAT HEAVY ELECTRICALS LIMITED

ORGANISATION

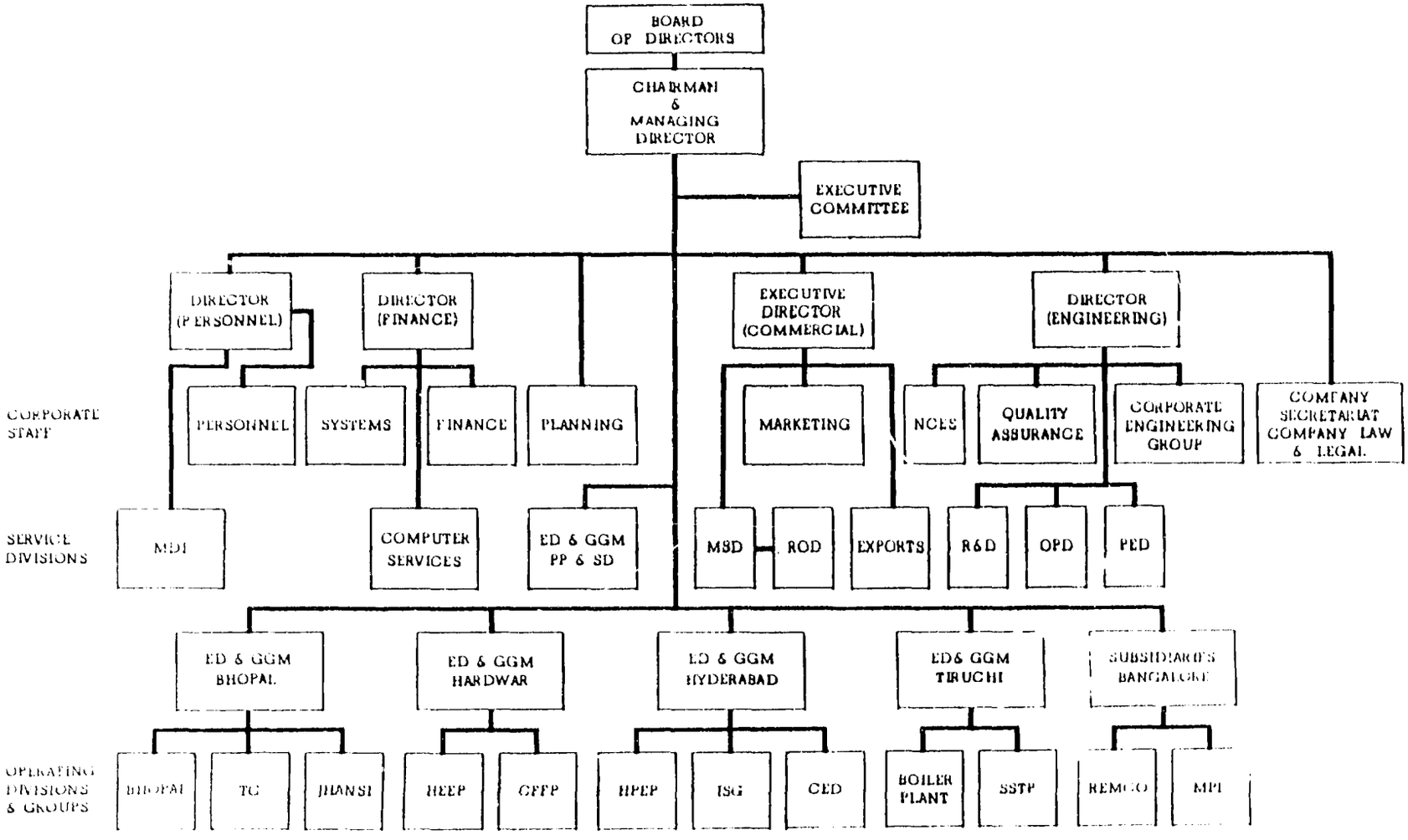


CFFP	: CENTRAL FOUNDRY FORGE PLANT
CED	: CONTROL EQUIPMENT DIVISION
ESNP	: ENERGY SYSTEMS & NEW PRODUCTS
ED & GGM	: EXECUTIVE DIRECTOR & GROUP GENERAL MANAGER
HEEP	: HEAVY ELECTRICAL EQUIPMENT PLANT
HPEP	: HEAVY POWER EQUIPMENT PLANT
ISG	: INDUSTRIAL SYSTEMS GROUP
MDI	: MANAGEMENT DEVELOPMENT INSTITUTE
MSD	: MARKETING & SALES DIVISION
MPL	: MYSORE PORCELAINS LIMITED
OPD	: OVERSEAS PROJECTS DIVISION
PPSD	: POWER PROJECTS & SERVICES DIVISION
PED	: PROJECT ENGINEERING DIVISION
REMCO	: RADIO & ELECTRICALS MANUFACTURING COMPANY LIMITED
ROD	: REGIONAL OPERATIONS DIVISION
R&D	: RESEARCH & DEVELOPMENT
SSTP	: SEAMLESS STEEL TUBE PLANT
TG	: TRANSPORTATION GROUP

August 1977

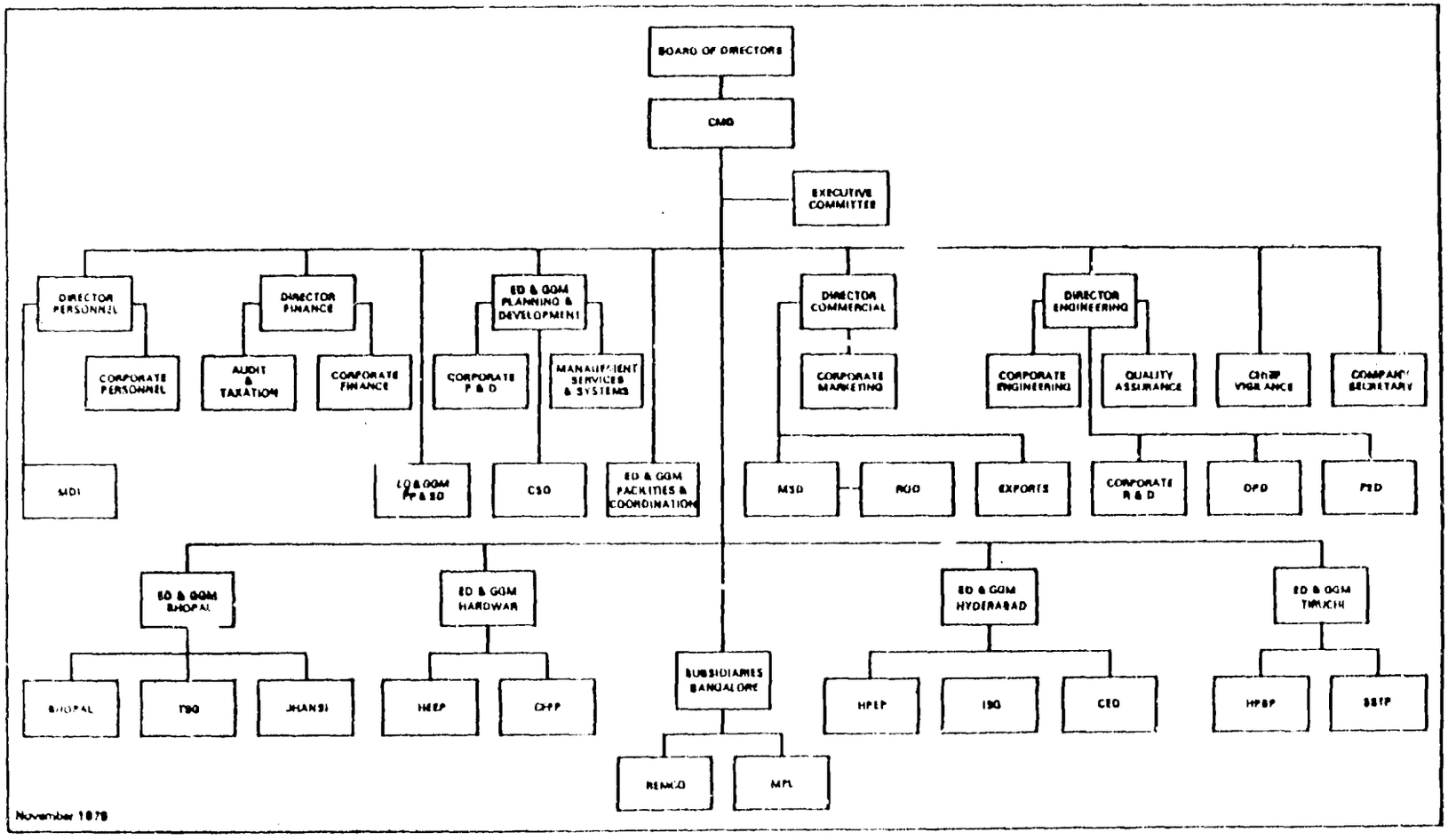
BHARAT HEAVY ELECTRICALS LIMITED

ORGANISATION



CFFP	CENTRAL FOUNDRY FORGE PLANT
CED	CONTROL EQUIPMENT DIVISION
ED & GGM	EXECUTIVE DIRECTOR & GROUP GENERAL MANAGER
HEEP	HEAVY ELECTRICAL EQUIPMENT PLANT
ISG	INDUSTRIAL SYSTEMS GROUP
HPEP	HEAVY POWER EQUIPMENT PLANT
MDI	MANAGEMENT DEVELOPMENT INSTITUTE
MSD	MARKETING & SALES DIVISION
MPI	MAINS LIMITED
NCES	NON CONVENTIONAL ENERGY SOURCES
OPD	OVERSEAS PROJECTS DIVISION
PP&SD	POWER PROJECTS & SERVICES DIVISION
REMCO	RADIO & ELECTRICALS MANUFACTURING COMPANY LIMITED
ROD	REGIONAL OPERATIONS DIVISION
R&D	RESEARCH & DEVELOPMENT
SSTP	SEAMLESS STEEL TUBE PLANT
TG	TRANSPORTATION GROUP

BHARAT HEAVY ELECTRICALS LIMITED
ORGANISATION



CED	CONTROL EQUIPMENT DIVISION	HPEP	HEAVY POWER EQUIPMENT PLANT	PP & SD	POWER PROJECTS & SERVICES DIVISION
CFFP	CENTRAL FOUNDRY FORGE PLANT	ISG	INDUSTRIAL SYSTEMS GROUP	R & D	RESEARCH & DEVELOPMENT
CMD	CHAIRMAN & MANAGING DIRECTOR	MDI	MANAGEMENT DEVELOPMENT INSTITUTE	REMCO	RADIO & ELECTRICALS MANUFACTURING COMPANY LIMITED
CSD	COMPUTER SERVICES DIVISION	MPL	MYSORE PORCELAINS LIMITED	ROD	REGIONAL OPERATIONS DIVISION
ED & GGM	EXECUTIVE DIRECTOR & GROUP GENERAL MANAGER	MSD	MARKETING & SALES DIVISION	BSTP	SEAMLESS STEEL TUBE PLANT
HEEP	HEAVY ELECTRICAL EQUIPMENT PLANT	OPD	OVERSEAS PROJECTS DIVISION	TSG	TRANSPORTATION SYSTEMS GROUP
HPBP	HIGH PRESSURE BOILER PLANT	P & D	PLANNING & DEVELOPMENT		
		PED	PROJECT ENGINEERING DIVISION		

P A R T - II

Evolution of Planning in BHEL

1.0 Evolution of Planning -- An Overview

1.1 The Context of National Planning

Planning in public sector enterprises (PSEs) in India had its own pattern of evolution. These enterprises were born as a part of the national planning process. Surveys were made for the requirements of various products and services. As these were for a fairly long time ahead, the PSEs had, as if, a long term plan right at the inception. The detailed project reports containing these thoughts and ideas were prepared either by the Indian organisation or jointly with the foreign-aid-giving/collaborating agency. Specific request for preparing these were made by the concerned Administrative Ministry depending on the nature of the product or service. These detailed project reports generally included an appreciation of the market/demand situation, the investment dimension and its phasing, the facilities configuration and engineering relating to it, the employment pattern, training needs and so on. The documents were comprehensive and provided a reasonably relevant data base.

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Managements of PSEs came to look upon these documents as definite programmes. Their approach towards these was one of project management i.e. an assumption of high degree of certainty. While these long term plans were well thought out, there were no built-in features for tackling uncertainties or discontinuities. No wonder, a stage was reached when the relevance of original concepts to changing environment was questionable. Most public sector enterprises, especially those in high technology engineering fields, and conceived in late '40s or early '50s faced enormous problems in the '60s. BHEL was no exception. But, fortunately for BHEL, its top management, well acquainted with the national planning process, started recognising the need for adaptation fairly early.

1.2 Early efforts of planning in BHEL

Various studies were initiated either by external agencies or by the top management of BHEL with the purpose of reviewing different facets of BHEL operations. Such a review could be compared to answering the question "where are we"? The period when these studies were initiated was marked by the absence of any long term power programme for the country, a mounting criticism of Indian power equipment manufacturers in the external environment and a general low level of morale in the public sector as a whole. The underlying

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purpose of the various review studies done during this period was improvement in certain management activities which could lead to immediate gains as well as development of an overall pattern of growth of this industry. A year-by-year account of the major landmarks may perhaps provide an insight into the process of evolution.

1.2.1 1970-71

Introduction of professionalism

The Indian Institute of Management, Ahmedabad was commissioned by BHEL to develop a Management Information System for the Company. This was with a view to ensuring that the top management of BHEL got the right information -- what they ought to get.

Simultaneously, other functional areas like financial management, personnel management, training, etc were being examined by the committees set up for this purpose by the Bureau of Public Enterprises (BPE) and also the Parliamentary Committee on Public Undertakings. The then Chairman's Office itself had undertaken an in-depth review of the operations of one division in response to a specific request of the Administrative Ministry.

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1.2.2 1971-72

Action Committee

The Government appointed an Action Committee to examine the operations of selected public sector enterprises. The committee headed by Mr MS Pathak included M/s KM George, VG Rajadhyaksha and Prof Nitish De. For studies relating to BHEL/HEIL, Mr V. Krishnamurthy was coopted. Professional managers and academicians had been inducted for such a review for the first time.

1.2.3 Internal Appraisal - Phase-I

The Action Committee reviewed the operations of BHEL and came up with certain wide-ranging and far-reaching recommendations. These included the merger of HEIL and BHEL -- the two PSEs -- with overlapping functions/products/markets, drawing up of comprehensive programmes to develop these factories to their rated capacity and the appointment of full-time Directors to look after the finance and personnel functions. The Committee had also suggested organisational changes at the unit levels. This included induction of professionals for managerial positions.

The most important task before the management was to increase the production and improve the capacity utilisation. As desired by the Committee, detailed programmes were drawn up using PERT networks for attaining rated capacities. This involved close interaction between the then Chairman's office and the manufacturing divisions.

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Various issues and problems were discussed and re-discussed in different forums and put to the top management for their consideration several times. After due considerations, the PERT networks were submitted to the Government and BPE.

1.2.4 1972-73

Organisational Measures

Following the recommendations of the Action Committee, the operations of both HEIL and BHEL came under the purview of the same top management as a first step towards reorganisation. A new Board of Directors took over, comprising of representatives from the Administrative Ministry, a Management expert, and full-time Directors for personnel & finance functions.

The introduction of full-time Personnel & Finance Directors was considered essential because it was felt that the poor performance of the public sector was primarily due to unimaginative personnel policies and low integration of the finance function with the executive wing. This had led to poor industrial relations and low executive morale. In addition, Finance acted as a curb on decision making. BHEL sought to remedy this by evolving and implementing company-wide policies in both these areas through the full-time Directors.

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Following the merger, an organisational model had to be found which would make the organisation efficient and effective. Two choices were available. The Company could be structured along the concept of a holding company or the divisionalised company. While the then Minister for Industry, Mr Kumaramanglam, was in favour of adopting the holding company structure, BHEL considered the divisionalised structure would be best suited for the consolidation and growth of its operations. There was considerable overlap in the product-mix of various plants. The same product was manufactured at more than one plant with more than one technology. There was a need to strengthen functional capabilities across the Company. Various limbs of the organisation could learn from each other's experiences. Successful experiences and practices of one group could be used by other groups. These things were possible only when various plants worked in an integrated manner. Therefore, a divisionalised structure was adopted.

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The role of the Chairman's office also underwent considerable change. Hitherto, its accent had been on project implementation within a national planning framework. In its new role, it concentrated on boosting up the production level and coordination between the three plants of BHEL and that of HEIL. It realised the need to integrate the technologies, attain higher levels of customer satisfaction and adapt the operations to meet the changing needs of the environment. It realised the need for more comprehensive planning - looking at the corporation as an integrated system. The word 'corporate planning' was still to come later. To help in these tasks, groups for planning, commercial coordination, finance and personnel were created at the head office.

In addition, men were identified for certain key positions in the different manufacturing units.

1.2.5 Foundation for Sound Industrial Relations

It was realised that long term industrial peace was necessary for attaining stability in the Company's operations. To put industrial relations on harmonious footing, one of the earliest actions of the new management was setting up of an apex joint negotiating committee with representatives from management, the national level trade union centres and the recognised unions at the divisions.

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1.2.6 Looking Ahead

This was also the period when BHEL was interacting with the Planning Commission and other Government bodies on the Fifth Plan formulation. Two important documents were prepared and were considered by the Board of Directors. These, namely, 'Perspective of Planning' and 'Strategy for Power Programmes' tried to put on paper the prospects that lay before the Company for next few years. These documents can be termed as the maiden efforts for taking a comprehensive look at the Company's operations and were the corner-stone for future developments.

1.2.7 Internal Appraisal - Phase II

To achieve coordination among the plants as well as for better communication and information-sharing, teams from chairman's office went to plants and held a series of discussions with the unit executives. The Directors of the Company and key executives from headquarters spent many days at the divisions talking & discussing with a wide cross section of employees, union leaders, heads of functions, etc.

The end of the year 1972-73 saw the undertaking of certain assignments by the summer trainees from the management schools at Ahmedabad and Calcutta, meant to inject further new ideas in the Company. These projects were on Environmental Analysis, Project Formulation, Market Surveys, Management Information System, Corporate Planning and Technological Forecasting. By choice or design they covered the entire range of activities corporate headquarters have to cater to.

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These projects laid the foundation for some of the Corporate activities which were taken up later. There was a new awareness in the organisation about the need for modernisation, for introduction of new, contemporary and relevant knowledge.

1.2.8 1973-74

Building up of Formal Systems

Having attained a certain degree of stabilisation in the production performance of the Company, the next task was to formalise and systematise certain functions of the Company. An attempt was made to integrate the annual budgetting exercise with the long term objectives of the Company. Key result areas were identified while formulating the revenue budget. This was a step towards introduction of a comprehensive Programme Planning and Budgetary System. To provide an opportunity for the top executives of the Company to meet periodically and discuss and formulate strategies for the growth and development of the Company, a formal forum, namely, Management Committee was set up.

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It was considered desirable that the operational experience at the four plants should be pooled and synthesised so that the experience and advances made in the relevant areas could be shared by each other. Synthesis was also necessitated by the fact that despite common products, these plants had different systems, procedures, cultures etc. patterned after the systems of their respective collaborators.

The chairman's office acted as a catalyst in this information sharing process. To aid this, a programme was drawn up for periodic conferences of various functional managers in the units. Thus, commercial managers, materials managers, production managers, finance managers, planning managers, etc got together periodically and shared their experiences, problems, practices, etc.

During this time, the project coordination and monitoring functions of the chairman's office had evolved themselves into a full-fledged Corporate Office comparable to that of any modern corporation. Policy guidelines and procedures manuals were prepared to bring in further uniformity in the operations.

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To bring in professionalism in the working of the units, studies were taken up in many functional areas. Consultancy assistance was sought from Administrative Staff College of India for establishing management training needs of the Company. Similar work was also taken up for streamlining the materials management and production planning functions at the Hyderabad and Hardwar units.

The discussions at various plants between Corporate management and the unit executives at all levels became frequent and exhaustive. Finally, a picture of Corporate objectives and the strategies to achieve these objectives started emerging. The stage was getting set for putting down these in a document and disseminating among executives and seeking sanctions and approvals from the Government. Fortunately, top management in BHEL took that vital step. It backed a near visionary effort to draw up the outline of a blue-print for the future.

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1.3 1974-75

Emergence of BHEL as a Planning Organisation

The year started with the publication of the Corporate Plan which summarised the perceptions and thoughts of the management, their interactions with the officers in the Company as well as various experts outside. This plan was submitted to the Government and was circulated to each executive in the Company.

With the active support of the Government, this document was to become a blue-print for all the major developments that have taken place in BHEL since then. The Corporate Plan called for, among other things, certain organisational measures and for this, organisational studies were made of comparable companies abroad. The comments of various divisions were received, compiled and reviewed at the Corporate Office. These became an important input in the implementation of the Corporate Plan.

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1.3.1 Integrated Budgeting Process

As a first step towards long term planning the time horizon of the revenue budget exercise was extended from one to two years and broad objectives of the divisions for the following two years were called for. This also provided a sort of linkage between the revenue and capital budget exercises. A team from Corporate Office went to the various plants and discussed their revenue budget with the multi-functional teams from that division. At the end of these division-wise discussions, an integrated revenue budget for the overall operations of the Company was prepared in the Corporate Office.

1.3.2 Engineering Reorganisation

Studies leading to the Corporate Plan had clearly identified that key resource of BHEL was Technology - applied in a wide sense. To remain contemporary in a fast-changing technological environment, BHEL's engineering base had to be strengthened considerably. A major element in the strategy outlined in the Corporate Plan envisaged reorganisation of the function. To draw up a plan of action, a committee comprising senior executives of BHEL was constituted in October 1974. The Chairman of the Company headed this committee. It came up with a plan of action by April 1975. Simultaneously, efforts were initiated to induct Indian scientists and technologists from abroad into the organisation. Some of the best talent which BHEL could attract in the following years was a result of these efforts.

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1975-76

The implementation of the reorganisation plan drawn up by the Engineering Committee began in 1975-76. Following its successful execution, it was considered necessary to have a similar review of the marketing function and a Marketing Committee was constituted on similar lines as the Engineering Committee. In addition, a new corporate group was created to provide staff support to the Corporate management in marketing area. This sort of experimentation in fact led to the planned and step by step emergence of what may be called as the 'Devices for Aiding Integrated Planning' in BHEL.

Besides having corporate level functional committees, another device adopted was the cross-functional teams looking after the long term plans and strategies for each product business area. These teams were formalised as the product committees. It is no mere coincidence that similar concepts were being tried out by BHEL's international contemporaries.

A number of service functions that were earlier integrated with the manufacturing divisions were taken out and put under separate divisions created for the purpose. Thus, a process of differentiation was initiated in the operations of the Company to concentrate development efforts in the individual functional areas. At the end of 1975-76, BHEL comrpised, besides the four main manufacturing plants at Hardwar, Bhopal, Hyderabad and Tiruchi, about 15 service divisions also. In addition, three new major factories were in the process of being set up at Jhansi, Hardwar and Tiruchi.

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1.3.3 Internationalisation

Export thrust was another major strategy outlined in the Corporate Plan. The rich experience gained by the Company from its association with the domestic power sector for 15 years had built up the expertise and confidence needed to make a significant breakthrough in the international arena. A modest beginning had already been made in the early seventies. Some of the steps which were taken included setting up of an Export Division, participation in World Trade Fairs and exhibitions and establishing commercial contacts with potential customers/countries. With this effort, export production in 1977-78 touched a figure of Rs.810 million, about 15% of the total outturn. Some of the prestigious orders won by the Company included a Rs.970 million order from Libya for a turnkey setting up of 2 x 120 MW power station, a Rs.95 million order from New Zealand for the supply of ten hydro generators aggregating to 544 MW and a Rs.650 million order from Saudi Arabia for Wadi Jizan Electrification Project.

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The production improvement programmes emphasised prior to and after the publication of the Corporate Plan, resulted in an enormous growth in BHEL operations. The salient features of this phenomenal growth have been very lucidly brought out by David Clutterbuck in his article on BHEL in May 1977 issue of the "International Management". A copy of this article is enclosed at Annexure I. But, this growth brought in its wake some problems. The operations became highly differentiated and spread over a large number of locations. This put great strain on the top management's time and effort. They were neither able to devote enough time on thinking about the long term future of the Company nor in developing their successors.

1.3.4 Reorganisation

To resolve this, the organisation was restructured in April 1976. Earlier, the General Manager of the division was responsible for all the functions and activities simultaneously. In the new organisation, the activities of the divisions were grouped into i) engineering and commercial; ii) operations; and iii) administration functions. Each of these groups was headed by a General Manager. An Executive Director and Group General Manager (ED&GGM) was appointed to head the division. This was more or less the system that was adopted uniformally at all the major divisions with certain local adjustments/modifications.

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It was felt that by making these three groups, a major share of the responsibility for day-to-day management could be delegated thus leaving the ED&GGM free to devote most of his time and effort to the long range planning of the products, divisions and human resource assigned to him. Conceptually, a division was seen as a developer of the two key resources : Technology and Human beings, and an efficient conversion system called Operations. Quite in contrast to prevailing notions - the personnel function was elevated; and finance function made the responsibility of chief of operations. GM (Administration) was responsible for catering to the organisational need of the human resource development. Finance function was seen as another input to operations, like materials. This, of course, meant that the chief of operations was capable of handling and optimising use of the vital resource - Money.

This reorganisation also helped in reducing the number of senior executives directly reporting to the Chairman and Managing Director. Corporate Office was further strengthened with the appointment of Director (Engineering) on the Board. The Engineering and Research & Development oriented divisions were put under his charge.

An Executive Committee was set up as the highest decision-making body in the Company. It replaced the earlier Management Committee. Existing organisational devices like multi-disciplinary forums on various functions, products, projects, etc were streamlined.

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1.4 Spreading the Planning Culture

The growth in operations led to an increase in the number of executives at all levels from about 1600 in 1972 to about 6000 in 1976. The timely flow of information from one level of management to the other became critical. In order to communicate the Corporate Plan and spread the planning culture in the organisation, and also to create an awareness of various planning techniques and methodologies, seminars were arranged in various divisions of BHEL. Today these seminars, conducted in the form of workshops, act as a forum for taking a collective look at various aspects of BHEL's business, especially the growth patterns for BHEL products. To develop better and professional managers at middle management level, the Company has set up a Management Development Institute. It conducts regular programmes in various areas of management.

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2.0 Corporate Planning in BHEL

Planning emphasis in BHEL has changed with the different phases of growth of the organisation. Beginning with implementation of the projects which were conceived as part of the National planning exercise, the Company has grown, actively pursuing its business objectives of profitable growth through creation of effective and efficient resources. Planning activity has evolved in keeping with the growth pressures, demands of the business environment and changing complexion of the organisational activity. For the purpose of study, three distinct phases can be identified in the growth of the Company.

2.1 Phase-I (1964-69)

The first task before the Company was the establishment of manufacturing capability. This involved commissioning of additional manufacturing facilities, transfer of technology from the collaborators to BHEL and striving towards achievement of the rated capacity. The planning activity for this purpose involved drawing up of detailed plans, preparing annual budgets to meet construction targets and monitoring and review of their implementation.

Environmental changes during this phase were rapid. Technologies were changing. Unit sizes were going up. BHEL could not respond to these changes quickly. New investments were required to meet these changing requirements. People doubted the wisdom of these investments sometimes.

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2.2 Phase II (1969-74)

Late 1960s was a period of recession in the Indian Engineering Industry. BHEL had established the manufacturing capacity, but its shops were not fully utilised. The charter given to it was to manufacture power equipment. But, the demand for power equipment was not steady. It fluctuated from feast to famine. The organisation did not know how to respond to such a situation. So far, all its efforts had been derived from National Plans and implemented with the help of the collaborators. For the first time, the organisation felt the need to look out for growth opportunities. Questions like 'What business are we in?', 'Where do we want to go?', 'How do we get there?' etc were assuming importance.

As a result of organisational cogitation, a set of objectives were formulated, a corporate identity was established and resource plans were prepared to strengthen the organisational capabilities. Salient amongst these were 'Growth Plan for Tiruchi Unit', setting up in-house facilities for meeting material requirements like castings and forgings, seamless steel tubes, ancillary development etc. At the same time, the business emphasis of Hyderabad plant was undergoing a change. Its product-mix was changing from power equipment to industrial equipment in response to changing needs of the environment.

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2.3 Phase-III (1974-79)

As the Company looked out and explored avenues for growth, it realised that defining its business as a manufacturer of power equipment was too restrictive. The Company could enhance its capabilities and enlarge the scope of its total business. It had technology to manufacture products like motors, control equipment, turbines, boilers, compressors, valves etc which were not only used in power stations but could also be used for industrial and transport applications. It resulted in greater involvement of BHEL in Industrial & Transportation sectors. For power stations, too, it could enlarge the scope to offer total turnkey service. This would, of course, imply developing in-house system-engineering and power project capabilities, but the Company felt confident that it would be able to do so. Thus, the concept of Company business changed from that of a hardware manufacturer to include enhanced software capabilities as indicated in Table I

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Table I

Changing Scope of Business

1973-74	1974 onwards
Products	Products and Systems
Manufacturing	Manufacturing
	Engineering
	Turnkey service
Power equipment &	Energy sector
allied products	Industrial sector
	Transportation sector

2.3.1 BHEL Objectives

Based on its own analysis and perception of the environment, needs of the organisation and changing concept of business, the Company decided to formulate a set of objectives which would provide the direction for its growth efforts. These are -

a. To achieve a dominant position in the engineering, development and manufacture of electrical and mechanical equipment for generation, transmission and utilisation of energy and electric power.

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b. To carry on a growing and profitable worldwide business in electrical/mechanical equipment for the generation, transmission and utilisation of energy and its related products, systems and service for power stations, industry, agriculture and transport.

c. To become a leader in research and development in different fields of engineering and technology in areas of work relating to the business and to ensure a steady flow of new products, process, services, methods, organisational patterns and relationships.

d. To ensure sound commercial policies, customer acceptance and satisfaction for the Company's products and services.

e. To design, manufacture and market all Company's products and services at good quality and fair prices.

f. To build public confidence for products and services bearing the Company's name and brands through sound competition, advertising, promotion, selling and services.

g. To evolve a participative style of management which will ensure good working conditions and job satisfaction to all employees, Wages commensurate with their performance, career advancement and goodwill amongst all employees, and respect for the human individual.

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h. To ensure continuous development of competent managerial personnel and make best use of both human and material resources of the business.

i. To design organisational structure with clearly enunciated objectives and policies where freedom to function and flexibility to perform will be ensured for all in accordance with their abilities, capacities, resourcefulness and initiative.

j. To provide a reasonable and adequate return on the investment capital and generate adequate internal resources to finance growth of the Company and fulfil national objectives.

k. To fulfil, as an instrument of social change by adopting Company policies, products, services facilities, plans and schedules, the social, civic and economic responsibilities, commensurate with the opportunities afforded by the size, success and nature of the business and of public confidence in it as a corporate enterprise.

l. To give full consideration to the environmental impact of all products and processes developed, designed and built by BHEL.

.../.

2.3.2 The Measure of the Task Ahead

The engineering industry in India came out of the recession in the early 1970s. Optimism of the period was reflected in the BHEL Corporate Plan of 1974. It states

Quote

There has been a seven-fold increase in the power generating capacity in India between 1951-52 and 1973-74, an increase from 2500 MW to about 19000 MW.

Per capita consumption rose from 15 KWH to 94 KWH. Impressive though this is, it is still far short of per capital consumption of 2000 to 6000 KWH in advanced countries.

The Fifth Plan estimates that, by 1978-79, India should have an installed capacity of 33000 MW, an increase of 14000 MW over what obtains today (1974). The net addition, however, will have to be 165000 MW in order to ensure an effective addition of 14000 MW after providing for replacements, and also for some capacity that will still be under commissioning trials at the end of the Fifth Plan.

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In the five years that will follow, in the Sixth Plan, an additional generating capacity of 22000 MW has been envisaged. Thus, cumulatively, in the next ten years we would have to bring into service a generating capacity of the order of 38000 MW on top of the existing capacity of 19000 MW.

In perspective, therefore, BHEL would have to ensure delivery of equipment which would triple the Power Capacity in a span of 10 years between 1974 and 1984.

The transmitting capacity has to keep up with the growth in power generation. This will mean a considerable increase in the demand for transmission equipment.

Besides power equipment, BHEL also manufactures a wide range of industrial equipment like Electric Motors, Transformers, Switchgear, Rectifiers, Capacitors, Railway Traction Equipment, Centrifugal Compressors, Process Boilers, Dust Collectors, Industrial Ventilators and Valves. These are at work in Petro-chemical and Fertiliser Plants, Oil Refineries, Mining, Sugar, Steel and Paper Industries, besides the Railways, to name a few. BHEL has now reached a strong position in the supply of these products.

BHEL's role in these areas is likely to expand and in future it will have to take up a greater share of engineering work for industrial projects, especially for drive systems in Steel, Metallurgical and other industries.

Unquote

2.3.3 BHEL : Goals and Opportunities

The BHEL Corporate Plan further states :

Quote

BHEL has to fulfil its long term objectives of meeting the growing power needs of the country. In the process, BHEL has to develop itself as the major instrument to help shape the energy policy of this country.

This. in effect, means that BHEL should

a. Manufacture and supply power equipment to the extent of over 5000 MW per year by 1980, and more, if possible, for further growth;

b. Erect and commission power projects quickly on a turnkey basis ;

.../.

c. Provide satisfactory after-sales-service to ensure the optimum availability from the installed power units;

d. Sell BHEL products and services to other countries, and gain a respected place among the international manufacturers of power equipment;

e. Develop R&D activities in such a way as to reduce dependence on foreign technologies, and keep the industry continually updated;

f. Develop new energy sources such as Solar and Geothermal; and, above all

g. Develop a new style in personnel management best suited to an industry of this type in the Public Sector, to bring about an increased sense of belonging and team-spirit among our employees."

Unquote

2.3.4 Restructuring of BHEL --

A Strategy for Continued Growth

An approach for the long term growth of the Company was outlined in the Corporate Plan as :

Quote

The present integrated structure of BHEL management has to give way to a functional orientation consequent on the considerable expansion expected at the manufacturing organisations to cater to increased volume of demand.

Rationalisation and standardisation of the products to be manufactured at BHEL is an immediate necessity. It calls for reorganisation of facilities and locations to optimise the output from the different manufacturing centres at minimum cost to customers.

To develop basic research facilities which are vital to a key industry of this type, and to keep them continually up-to-date.

.../.

To develop common integrated Indian design philosophies based on our knowledge of the different technologies received from different foreign collaborators on the same products.

Fuller development of design and manufacture of products which are today considered auxiliaries to the power system, to exploit fully the available engineering know-how, and to meet the market demands of other sectors of development.

Based on the experience of running the existing plants, the manpower in any manufacturing centre should not be allowed to exceed 10,000 in all. Every attempt at restructuring will keep this limit in mind.

A separate treatment will be necessary to develop an export market for BHEL products. A target of 20 to 25 per cent of its capacity should be set by BHEL for export.

.../.

To organise the construction and commissioning of power stations on a turn-key basis.

To develop a Consultancy Engineering Organisation not only to help satisfactory engineering of power projects, but to serve other industries also.

To improve the after-sales-service to customers.

To achieve vertical integration through production of alloy steel forgings and castings, welding consumables, nihard rolls, austenitic steel tubing, electronic controlgear, large fabricated elements, and insulation materials, as a means to ensure reliability of main manufacturing operations.

To ensure urgent development of know-how for non-traditional energy systems such as MHD, coal gassification, Fluidised Bed Boilers, Solar and Geo-thermal.

To ensure a satisfactory return on investment."

Unquote

2.3.5 Implementing the Corporate Plan

The first step taken was to explain to all the employees the implications of the changes envisaged in the Corporate Plan. A series of meetings were held with various groups of employees at all levels and the rationale of the Corporate Plan was explained to them and their ideas for its effective implementation were sought. This was followed by regular interaction and discussions at all levels before any changes were introduced. In fact, the involvement of the mass of employees in discussing the pros and cons of major policy changes before their introduction has proved very effective in BHEL. In technologically complex areas, many good suggestions have emerged from these discussions and these have been incorporated in the final decisions.

It was realised that the then existing organisation would not be able to cope with the enlarged scope of the Company's objectives and operations. There was need to establish new divisions and reorganise some of the existing functions to provide an intensive and directed thrust to the operations in these functional areas. New divisions such as Corporate Research and Development Unit, Power Projects & Services Division,

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Marketing and Sales Division, Energy Systems and New Products Division, Projects Engineering Division, and Overseas Projects Division were created to effectively fulfil the objectives of the Company.

In fact, one of the major achievements of the Corporate Plan has been to completely reorganise BHEL's total engineering management structure and orientation. It has been realised that an engineering-based company can never hope to reach the desired level of effectiveness without a solid base of specialised knowledge in all aspects of product design and in all related areas of scientific expertise. In-house R&D is necessary not only to establish new products and systems and to improve existing ones, but also to maximise the assimilation of know-how purchased from outside.

The Corporate Research & Development Unit provides the infrastructure, the laboratories and the expertise for basic research. The Projects Engineering Division undertakes the detailed design of Power Stations and Power Systems to ensure the compatibility of products with the needs of the Power Systems.

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The Energy Systems and New Products Division was established to catalyse the development of new products and futuristic systems including new coal utilisation systems and non-conventional energy sources. In addition, each product was allotted its own engineering centre for detailed engineering, product related improvement, research and development and for field engineering services. A regular monitoring of the entire technology absorption, assimilation, adaptation and improvement process was started and became a part of the engineering management system.

Similarly, to augment the organisational capabilities in marketing BHEL products both in domestic and foreign markets, three new divisions were started -- Marketing and Sales Division, Regional Operations Division and Export Division. Another division called Power Projects and Services Division was started to provide erection and commissioning and after-sales service to the customer. This division undertakes turnkey responsibilities for power stations in India.

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None of these organisational changes would have been effective without the simultaneous changes which were introduced in the personnel policies and financial management systems. The promotion policies, with emphasis on the growth of the individual, helped specialisation. Training and advanced education programmes have been made continuous inputs to all levels of employees to increase their technical expertise, and management development courses were widely used to improve their managerial effectiveness.

The financial management systems established delegation of authority way down the line and simplified procedures to promote quick decision-making. Flexibility in operation was combined with strictly-defined responsibility and accountability. Reporting and information systems were established to keep the management fully and regularly informed about the operational status at all the divisions.

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Another major step taken by the organisation towards improving its effectiveness through better utilisation of the resources, was rationalisation of diverse design philosophies which existed for many of its products. While a phased-out programme for consolidating the manufacture of these products at 'one centre' is still in the embryonic stage, the engineering and development work for each of these products has been brought under the responsibility of 'one centre'. Best features of all available designs have been utilised to establish BHEL designs for many products. In all cases, detailed analysis of feedback data from the field is continuously carried out to modify and improve the original designs to make them perform better under Indian conditions. Only in the case of one product, transformers, manufacturing facilities have been set up at a new location to consolidate and further augment the Company's operations in this product area. An internal transfer of technology has taken place in this case and the total project from its inception was done with internal expertise.

.../.

To update the technologies which had become obsolete, a programme to modernise the manufacturing processes as well as the plant and machinery was taken up at all the units. In fact, with the growing expertise, in the organisation and with a proven record of achievements, it was possible to discard licences which were not considered satisfactory and enter into collaboration with more advanced companies. For example, BHEL entered into a collaboration for manufacture of boilers with Combustion Engineering of USA even when its existing collaboration with Skodaexport of Czechoslovakia had not yet expired. The base of collaborations was also made wider and they covered not only design details but also the transfer of know-why, joint design development and joint R&D projects with full BHEL participation.

Simultaneously, in the areas where rated capacity had not been achieved, time-bound programmes using PERT networks were used to reach the rated capacities. To improve the productivity of these facilities, some of the steps taken included scientific production-planning, better coordination between various agencies, rationalisation and standardisation of designs, introduction of newer processes and latest tooling, etc.

.../.

Diversification was resorted to without any substantial increase in investment in areas where the demand for the original product had diminished. A number of new products like compressors, industrial turbines, oil rigs, bowl mills, etc have been added to the Company's products, as part of a broad diversification programme. Thus, three fourths of the increased production of the Hyderabad unit between the years 1973-78 came through new products involving more sophisticated technologies under the diversification programme.

2.4 Planning needs of 1980s

The growth plan for the next five years viz 1978-83 envisaged BHEL turnover to reach about Rs.12,000 million (approximately $ 1.5 billion) by 1983, from Rs.6,300 million (approximately $ 750 million) in 1978-79. This, together with the turbulent environment in which the Company found itself, had put a tremendous pressure on the organisation to develop an entirely new style of management. Keeping in view the rapid rate of technological obsolescence, increasing competition in the domestic as well as export markets and rising uncertainty regarding the general business conditions, it had become imperative for the organisation to develop ability to cope up with change,

.../.

modernise and expand its manufacturing base, update the technologies, give added thrust to its marketing operations, develop strategic management capability, enhance information processing capability, and introduce contingency planning in all areas of business operations in the organisation. Steps have already been taken in this direction and it is hoped that the organisation would be able to meet the challenges of future with the enhanced planning capability which is being introduced in the organisation.

A glimpse of the future organisation can be provided by attempting an organisation chart for the 1980s. Same is given as Annexure-II.

3.0 Formalisation of Planning Activity

Corporate Plan of 1974 was a watershed in the planned growth of BHEL. It brought the latent energy of the organisation to fruition. BHEL grew rapidly in business volume, profitability and complexity. As the manufacturing and service divisions multiplied and the business expanded across new product-market territories, it became imperative to formalise and structure the planning activity in the organisation. Following structure has since been introduced :

.../.

a. Product plans as basic unit for strategic planning for the product business

b. Functional plans to strengthen the functional capability

c. Divisional plans for growth and utilisation of resources at each division

d. Sector plans for long term growth of the Company business in the respective section

e. Corporate Plan : Synthesis of above plans.

Planning is a continuous process. The upshot of what I wanted to say was simply this. BHEL was born as part of a national planning process. It had the unique chance of being influenced by the planners for a long time. It learnt to plan. To believe that a plan is not a destination. To plan also means to adapt. In the ultimate analysis, even the planning process has to be adaptive - This BHEL has learnt - hence its planning process is worth studying. Its planners can help other enterprises especially in developing countries.

PRODUCT RATIONALIZATION GENERATES SUCCESS

How Bharat Heavy Electricals achieved a turnaround

WHEN THE INDIAN government wanted to show Robert McNamara, president of the World Bank, a prime example of a profitable state-owned company, it chose Bharat Heavy Electricals Ltd. (BHEL). The Delhi-based firm, which last year reported profits of $26 million on sales of around $430 million, manufactures most of India's electricity generating equipment and systems. It is fast acquiring a reputation as a serious contender for major international contracts, selling heavy electrical equipment or complete systems to countries as diverse as New Zealand and Libya.

BHEL was created three years ago from two large heavy electrical manufacturers, both of whom had a long history of making financial losses. Of the four main plants in the new company, only one, the boiler plant at Tiruchirapalli, in the far south, had been consistently profitable. In 1972 the head of that unit, Venkatraman Krishnamurthy, was made chairman and managing director of both the original companies, which finally merged in early 1974.

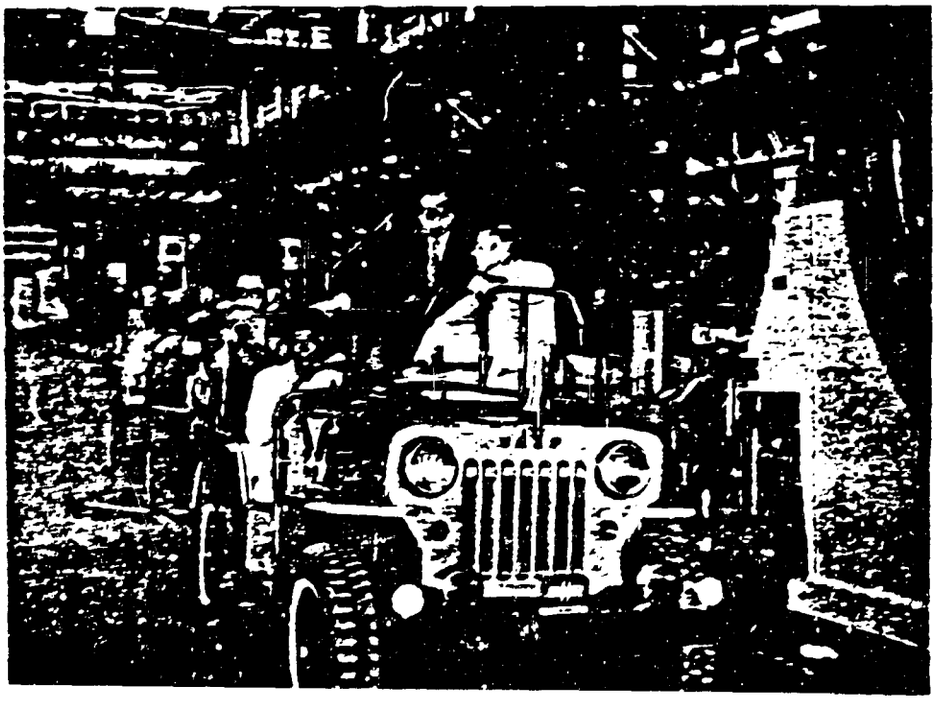
Krishnamurthy found himself faced with enormous problems in integrating the hotch-potch of plants and technologies in the new organization. The new company had three competing product ranges, based on technical collaboration with three different countries. Communication and co-operation between the plants were made difficult by the immense distances between them. None of the main plants is closer than 800 kilometres to its nearest neighbour. The company also suffered from a lack of forward planning, overmanning and poor productivity.

In spite of all these difficulties, however, BHEL has now become a much more cohesive organization with considerable flexibility. The annual growth rate has averaged 40%, compared with little more than 10% in the previous five years. The former losses, which once amounted to some $90 million, have been wiped out.

So pleased is the Indian government with BHEL's success that the heavy electrical company has been given the task of nursing other firms back to health, including a porcelain company and an electrical goods manufacturer.

"We have proved," says Krishnamurthy, "that a multi-unit corporation really can be managed successfully in India."

The problem of competing products and the lack of co-operation between managers at different plants has occupied much of Krishnamurthy's time. Says finance director S.V.C. Raghavan: "We found people at, say, our Bhopal and Hardwar plants telling customers about each other's product defects." Bhopal had been built with British technical expertise to produce generating machinery of British design. Similarly, the plants at Tiruchirapalli and Hyderabad were building equipment based on Czechoslovakian designs, and



At the head of the cavalcade, chairman Venkatraman Krishnamurthy (standing) accompanies World Bank president Robert McNamara (far right) around the company's Hyderabad plant.

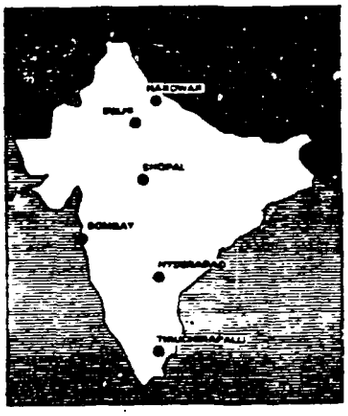
Before the re-organization one plant could have a
b klog of orders while another would be searching for business

the plant at Hardwar was producing according to designs from the Soviet Union.

"If a customer needed a particular product he didn't know where to go," says Krishnamurthy. "He would find three different plants and receive no co-ordinated advice about which was the best for his particular circumstances."

Adds Raghavan: "We couldn't afford three types of equipment using different spares and designs."

BHEL did not try to rationalize this confusion by making one of three technologies the basis of a standard product range. Nor did it try to split up the various components of a power generating system between the different plants, giving one sole responsibility for, say, switchgear and another sole responsibility for, say, steam turbines. Instead Krishnamurthy adopted a more gradual approach of



Co-operation between BHEL's four main plants was hindered by the great distances between them. None is closer than 800 kilometres to its nearest neighbour.

rationalizing development work. The company introduced a programme aimed at producing a range of equipment that would eventually include the best of all three designs, together with ideas born of the Indian engineers' own ingenuity.

The company split its entire product range into eight divisions. One, for example, covers all switchgear, capacitors and transformers. Another deals with control gear and motors. Development work in each division is controlled by an engineering development manager (EDM), although the plant managers retain responsibility for manufacture.

The eight divisions cover 21 main products, each of which now has its own development centre. The centre is based at one plant, and is intended to concentrate resources for designing future products. Engineers and designers from all the plants that formerly made hydro-turbines now work together at the hydro-turbine development centre at Bhopal, for example. However, the plant at Hardwar still produces hydro-turbines and its engineers still make minor modifications to designs to suit particular orders.

Hardwar in return has several development centres of its own, including one for turbo-generators.

A recent order for a turn-key power station project in Libya demonstrated one result of this merging of ideas. The development centre for turbo-generators at Hardwar decided that the Bhopal plant's basic British design was best, in this instance. However, it also directed that it be modified considerably with improvements based on the Czechoslovakian and Soviet designs.

Each EDM is helped in deciding long-term design objectives by a product committee, on which representatives of other company functions, such as marketing and personnel, sit. He also receives advice from the higher level corporate engineering committee, which defines over-all company engineering goals.

The high-level co-operation between the plants means that the workload can be distributed much more equitably than before. Previously, one plant could have a backlog of orders while another would be searching for business. Now several are capable of making the same product. "Customers used to complain of delays," says Krishnamurthy, "but we keep almost all our delivery dates now."

The senior level structural changes could not have brought about the necessary cross-fertilization, however, unless the engineers themselves were sold on it, and had the opportunity to exchange ideas. Krishnamurthy embarked on a massive programme of relocating, consulting and training the engineers.

In March 1973, the company had 2,700 graduate staff. It now has 6,000. About 1,000 of these have been transferred from one area of the company to another, bringing their expertise with them. At the same time, people were encouraged to visit other plants. Because of the immense distances involved, "travel became an occupation," declares Raghavan.

S.R. Choudhury, a project co-ordinator at corporate headquarters in Delhi, used to be head of a computer department at Tiruchirapalli. He recalls: "All 50 or so graduate employees in my department were exposed for half a day to visitors from other plants. We had two hours of questions from the visitors about our work, then after a break, we had the chance to question them. In some cases we found there was over 50% duplication of effort between our departments and theirs." ▶

The term "corporate planning" came to the firm from a junior trainee on secondment from a business school

The engineers also met each other at frequent training courses, where lectures were given by both BHEL's own staff and outside experts. Many of the courses lasted two or three weeks. At the end of each long course the participants had to say how they intended putting into practice the things they had learned.

The new concept of development engineering was introduced to the engineers through personal visits by senior executives to the plants. At first they were met with some hostility and suspicion. Explains Dr. H.N. Sharan, director of engineering: "Each group of engineers had identified themselves with the design in which they had been trained. They were also afraid that we would downgrade the importance of one unit at the expense of another. Before we visited them we sent everyone a copy of the draft proposals outlining the planned changes in development work. Then we had on-site meetings of around 500 engineers and told them our ideas. Lastly we met them department by department. We put before them all the problems as we saw them and how we thought they ought to be solved. Many of our ideas were severely criticized."

All the engineers' comments were recorded and discussed at corporate headquarters. As a result, a number of large and small changes were made in the plans. "For example, it was originally intended to locate the engineering development centre for hydro-turbines at Hardwar because it has a hydro-turbine laboratory," says Sharan. "The engineers pointed out other advantages of Bhopal, such as the electrical expertise there. We changed our minds. Looking back, it was a good decision."

The trade unions also had the opportunity to discuss the changes with top management. Only one part of the plan gave rise to strong resistance — the intention to limit the growth of Bhopal. The Bhopal plant had 20,000 employees, twice as many as any of the other major plants. Top management agreed to hold this issue in abeyance, and promised no one would be made redundant by the changes.

A considerable reduction in the workforce at Bhopal has in fact already taken place, simply by encouraging people to move to jobs elsewhere. The accounting department, for example, was badly overmanned and has shrunk from 650 people in 1974 to only 200 today. "People like to move out of Bhopal now because they see their career prospects improved," says Raghavan.

Before the restructuring, says Krishnamurthy, "an engineer at Bhopal would consider he was working for the Bhopal plant. Now he thinks he is working for, say, the steam turbine division."

"A BHEL corporate man has emerged," adds Raghavan.

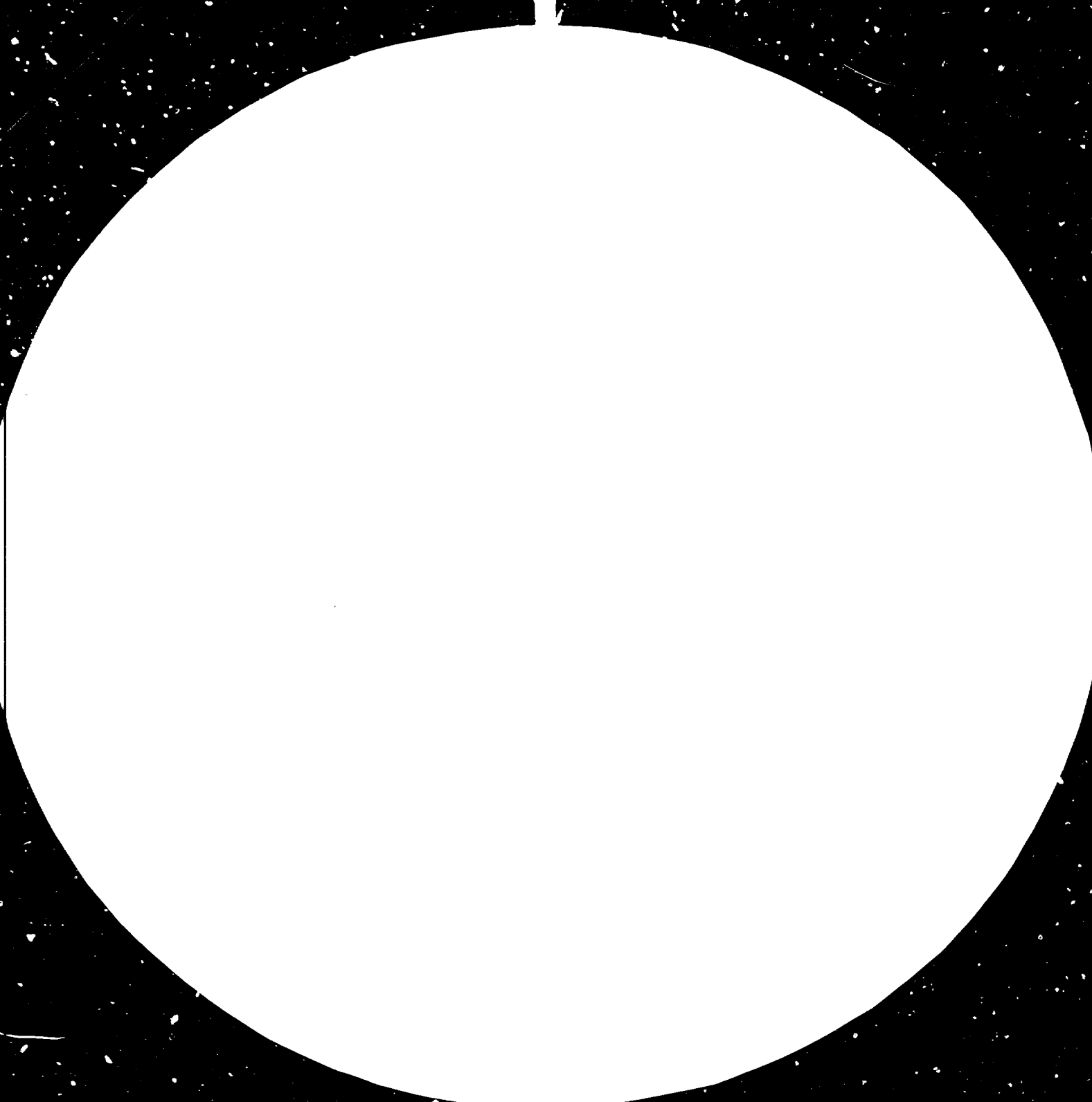
The co-operation and co-ordination of all the plants meant that the company could start to make meaningful long-term plans. The need for effective long-range planning was underscored by a study four years ago that showed the company would be working on 115 power station sites simultaneously by 1980.

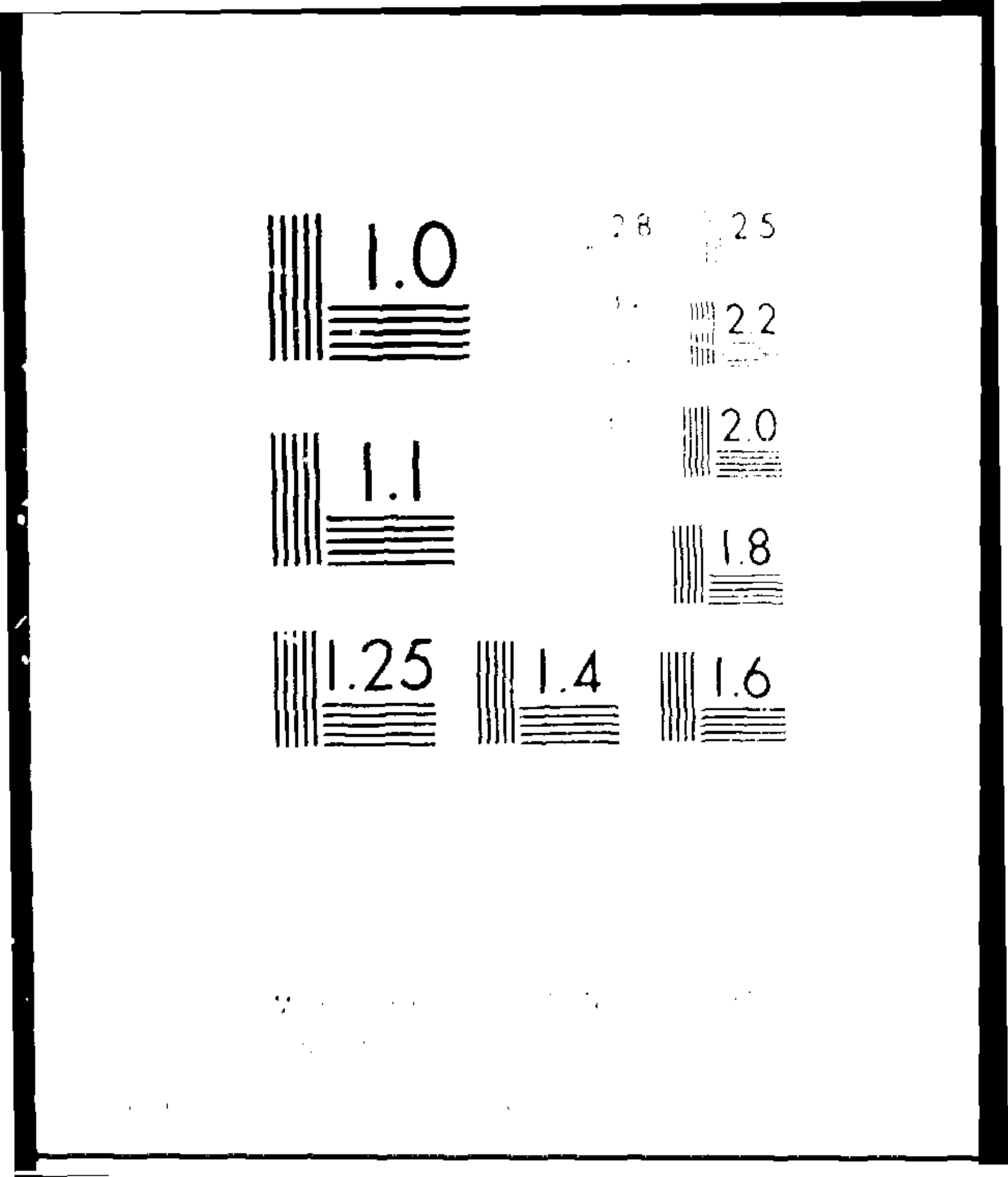
"The very term 'corporate planning' came to us from a junior trainee on secondment from a business school," admits K.R. Paramesvar, head of planning and development.

Paramesvar explains that the company rarely used to come within 70% of budget on investment plans. He adds: "Now major schemes have a project review system. People from the project meet with top management and the corporate planning committee once every two months. In fiscal 1975 achievement against budget was an average of about 95%. Because they are clearly formulated, BHEL's investment proposals are already cleared by the government to the end of the current national five-year plan, in March 1979. Before, we would only have instructed executives to set to work on projects after the government had given the go-ahead." By the end of 1976, BHEL was already working on 63 sites at the same time, compared to only 12 before formal planning was instituted.

The increased productivity that allows the company to spread its resources over so many orders is not just the result of better planning. Krishnamurthy also set about motivating the workforce to improve its own working methods. One step was to establish work councils at corporate, plant and shop-floor level, in which problems such as productivity could be thrashed out. More directly, however, the company invited Professor Nitish De, dean of the government-backed National Labour Institute, to undertake some experiments in job redesign. Workers at Hardwar were persuaded by De and by trade-union officials such as Naresh Dutta, of the All India Trade Union Congress, to learn to do each other's jobs. The first department to take on the task made the upper part of large condensors. Welders taught fitters their trade and vice versa. Currently half of the welders and fitters in that department have both skills, and productivity rose from 17% of the theoretical maximum in July 1975 to 73% in January 1976.

By DAVID CLUTTERBUCK
Associate Editor

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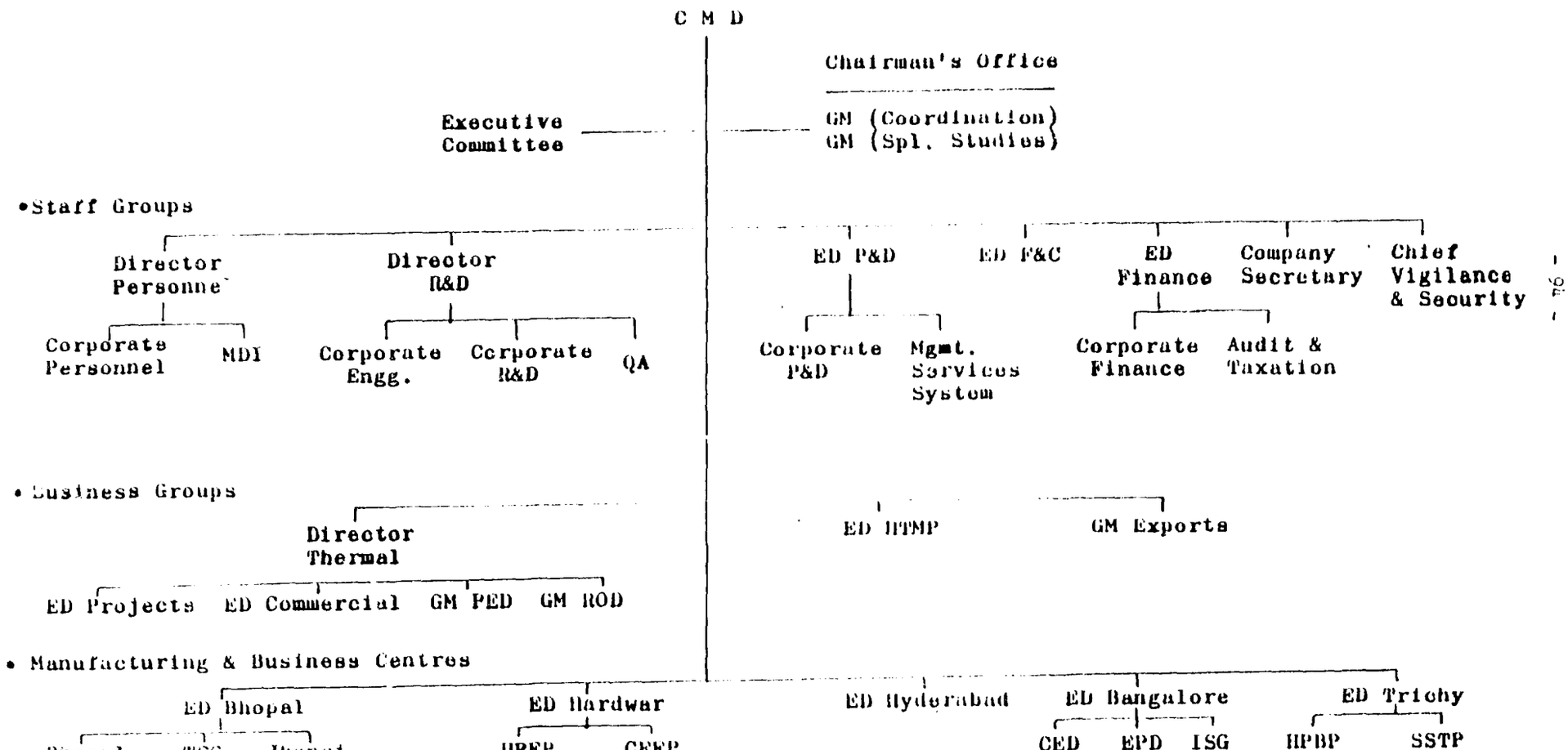
Annexure II

BHEL - 1980s



Legend

CMD	Chairman & Managing Director
GM	General Manager
ED	Executive Director
R&D	Research & Development
P&D	Planning & Development
F&C	Facilities & Coordination
MDI	Management Development Institute
QA	Quality Assurance
PED	Project Engineering Division
ROD	Regional Operations Division
HTMP	Hydro, Transmission & Motor Products
TSG	Transport Systems Group
HEEP	Heavy Electrical Equipment Plant
CFFP	Central Foundry Forge Plant
HPBP	High Pressure Boiler Plant
SSTP	Seamless Steel Tubes Plant
CED	Control Equipment Division
EPD	Electro-porcelain Division
ISG	Industrial Systems Group

P A R T - III

BHEL - The Public Sector Enterprise

and

Management of its 'interlinkages' with the Environment

1.0 BHEL as a Public Sector Enterprise

A public sector enterprise (PSE), as the name suggests, has a dual role to perform. It is both 'public' and an 'enterprise'. It is this duality of role which leads to multiplicity of objectives and makes the planning and management of these enterprises so challenging.

1.1 Planning in BHEL, like any other enterprise, means

- setting up Company objectives
- identifying growth opportunities in the business environment
- drawing up strategies to manage the environment in order to exploit the opportunities
- creating and managing Company resources to implement the strategies

As an 'enterprise', its objectives stem from its concern for growth and profitability. Its perception of the environment and formulation of strategies to exploit it arise from this concern. But the 'public'aspect of its constitution makes it take a much broader view of its environment.

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1.2 As an enterprise, BHEL's environment comprises

- Share-holders viz the Government
- Markets, customers
- Industry, competitors
- Trade unions, workers
- Financial institutions, banks
- Regulatory agencies for licensing, company law, foreign exchange regulations, taxes, excise etc.
- Society at large

As a public sector enterprise, BHEL's environment assumes a much larger dimension. The Government tends to dominate it as the shareholder, customer, supplier and competitor in addition to its role of regulatory agency. BHEL's major customers are State Electricity Boards which are Government departments. Its major suppliers include Steel Authority of India (SAIL), Hindustan Copper, Minerals & Metals Trading Corporation (MMTC), Hindustan Machine Tools (HMT) etc which are PSEs like BHEL. Prior to merger, only competitor of BHEL was Heavy Electricals (India) Limited (HEIL), another PSE.

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Some of the present competitors include New Government Electric Factory (NGEF), Bharat Heavy Plates and Vessels (BHPV), Electronic Corporation of India Limited (ECIL), Bharat Electronics Limited (BEL) etc, again PSEs. BHEL has to get all its plans approved from the Government; which allocates the resources as well as guides its choice of business. In addition, Government monitors its performance.

1.3 Planning in BHEL is dove-tailed with the National Planning process. Company prepares five-year plans in accordance with the National five-year planning cycle. The process itself is two-way. While the assumptions. objectives and programmes outlined in the National five year plans influence BHEL in its planning, BHEL's own entrepreneurial activity tends to influence the National planning process. In fact, there are forums like working group on electrical equipment industry, constituted by Planning Commission, where BHEL representatives sit with representatives of various governmental agencies, other enterprises both in public and private sector, and hold discussions which form an important input in the preparation of plans. There is considerable scope for entrepreneurial planning by BHEL within the scope of the National Plans and in addition to them.

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1.4 Government's concern with respect to plans of public sector enterprises is mainly in the area of resource creation viz investments, collaboration agreements, manpower etc. For example, there exists a fairly elaborate structure for the approval of Investment Proposals of public sector enterprises. The agencies involved in this process include the Administrative Ministry (Ministry of Heavy Industry for BHEL). the Bureau of Public Enterprises (BPE), the Public Investment Board (PIB), Project Appraisal Division (PAD) of the Planning Commission, Finance Ministry and the Union Cabinet. An Investment Proposal is first scrutinised by the Administrative Ministry and its Finance Wing. If the Proposal is in excess of certain fixed amount (Rs.50 million in case of BHEL), it is forwarded to the PIB for an initial appraisal. PIB consists of high level representatives of Finance Ministry, Planning Commission, BPE and the Administrative Ministry.

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If the Project is approved, the PSE is asked to submit a feasibility study. The feasibility study is circulated to the Finance Ministry, BPE, Planning Commission etc and a report regarding the comments of these is forwarded to the PIB along with the feasibility report. If PIB approves the feasibility report, the Proposal is then sent to the Union Cabinet for approval. Once the Project is cleared by the Union Cabinet, a detailed project report (DPR) is prepared for implementation of the project.

Conflicting interests of various groups come to the fore during the preparation and scrutiny of the investment Proposal. Investment Proposal for the PSE may be in line with its growth objectives, greater capacity utilisation, diversification, profitability, etc. The Government perspective may be influenced by the National Plan priorities. For example, BHEL's Corporate Plan envisaged diversification into consumer electrics.

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It was not acceptable to the Government even though this forms an important part of the product-mix in most of the international organisations, who are in similar business areas as BHEL.

Similarly, in the early 1960s, when new manufacturing units of BHEL were being set up, the Government decided that one major plant should be located in the Northern states of Uttar Pradesh and the other in the Southern state of Andhra Pradesh/Tamilnadu. Government also desired that the new units should be set up in the industrially backward areas. Thus, plants were set up at Hardwar, Hyderabad and Tiruchirapalli although infra-structure facilities were better in some other places.

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1.5 Another area of Government control over the public sector enterprises lies in the appointment and promotion of senior executives. Board of Directors of a public sector enterprise is appointed by the Government. It consists of external and internal directors. Some of the external directors are from various wings of the Government. Typically, BHEL Board will have a representative of the Department of Heavy Industry, Finance Ministry, Energy Ministry, State Electricity Boards etc. For appointment of full time Directors, Public Enterprises Selection Board (PESB) interviews and recommends the possible candidates to the Administrative Ministry. The Selection Committee includes the Secretary of the Administrative Ministry and the Director General of the BPE. The Chairman of the Company sits on the Selection Committee for the second level posts. BPE acts as the Secretariat for PESB. Appointments Committee of the Cabinet (ACC), which is headed by the Prime Minister and includes the Home Minister and the Minister of the concerned Department; finally notifies the appointment of the Chief Executive & functional/whole-time Directors.

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The selection of next level of managers viz General Manager's rank is done by a committee formed by the PESB. Members of this committee include the Chairman and Managing Director for the PSE, outside experts and a representative of the PESB.

Recruitment of managers at the level below that of General Manager is done by the PSE itself.

Earlier. for financial control, the Financial Adviser and Chief Accounts Officer (FA & CAO) for the individual units used to be appointed in consultation with the Finance Ministry. In addition to his normal duties as the Chief of Finance Function in the Unit for which he reported to the top management of the Company, he also performed a 'watch dog' function on behalf of the Finance Ministry. BHEL has moved away from this concept and appointment of the Finance Manager in the Company is a decision of the Company management.

1.6 Public Sector considerations also tend to guide BHEL's choice of business. Many a time, PSEs with a good record of performance, are expected to shoulder additional responsibilities which may not be the most desirable from pure enterprise considerations. For example, following the oil crisis, when India entered the field of oil exploration, there was a sudden demand for oil rigs. While long term demand for this product was uncertain, there was an urgency with respect to the immediate demand. BHEL offered to help and was entrusted with this responsibility even though it had only a limited commonality in terms of product range or technical capabilities required for manufacturing this product.

Another example can be given of divestment of a highly profitable product. BHEL business in utility and industrial boilers enjoys an extremely good market both in India and abroad. For its industrial boilers which are needed by various process industries, there had always been a heavy demand. Customers had to wait for getting a BHEL boiler due to heavy order bocking. But, they would rather wait than buy it from alternate sources. It was also a highly profitable product. BHEL gave away this product to another PSE under the Department of Heavy Industry.

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Even in case of utility boilers, BHEL had to share its business with another enterprise. BHEL boilers were posing a serious threat to its only competitor, a company in the private sector. As a public enterprise, BHEL felt responsible to help any unit which was likely to become sick. It, therefore, offered to pass on some of its own orders to this company to ensure a minimum capacity utilisation of the privately owned organisation.

In fact, in 1977-78 a comprehensive exercise was initiated for a product rationalisation between various public sector enterprises under DHI as a sequel to sporadic efforts by BHEL in this direction. Some of the PSEs, who had not been doing well, became a direct beneficiary of this exercise as BHEL sub-licensed them to take up the manufacture of some of its highly profitable businesses.

Similar examples can be given for Government influence in choice of strategy for growth. BHEL products need considerable amount of electronic equipment. If BHEL could set up in-house manufacturing facilities in this area, it could not only meet these requirements, it could also acquire the flexibility to enlarge its role in the industrial sector to offer total drives and control systems. BHEL decided to enter this area of business by taking over a sick unit which Government wanted to revive. REMCO, the unit BHEL took over as sick, is today, as its Control Equipment Division (CED), one of

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the most sophisticated and fastest growing electronics unit in India.

1.7 BHEL has always been keenly aware of its role as a premier public sector enterprise. In fact, most of its achievements as a successful enterprise have benefited the public sector in general. It has shared both its business and resources with other PSEs. Both its managers and management systems, carefully and systematically developed and nurtured over time, today, are playing an important role in the management of various other PSEs. Despite pressures of its own growth, BHEL is perhaps the largest donor of its managers to other PSEs today, and quite a large number of senior executives in other PSEs have come from BHEL.

BHEL Corporate Plan of 1974 was widely acclaimed as a watershed in the history of public sector in India.

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Even though it was purely an internal exercise of the Company and there was no requirement from the Government for its preparation or approval, BHEL on its own decided that Government as its shareholder should be informed of its growth plans. When the formal document was sent to various agencies including Ministry of Heavy Industry, and BPE, it became an instant success as a concept, with them. Mr Proxy Fernandes, the then Director General of the Bureau of Public Enterprises, took extra-ordinary interest in analysing the Plan and wrote to all other PSEs to learn from BHEL's Corporate planning exercise and prepare their own respective Corporate plans. Despite its confidential nature, BHEL gave away copies of its Corporate Plan to a large number of PSEs and helped them to prepare their own Corporate Plans. Some of these assignments almost meant full fledged consultancy service to these enterprises.

1.8 As a public sector enterprise, BHEL has, many a time, acted as an extended arm for fulfilling Government's development objectives. It has conducted techno-economic as well as socio-economic surveys and prepared growth plans at the sectoral, regional and national levels. Some of its major projects in this area include developing industrial development plans for Orissa (a state in India), Nepal (a developing country in the neighbourhood); conducting a techno-economic survey for the Geological Survey of India; setting up a joint venture company in Libya with the Libyan Government and participating in the working of inter-government joint commissions.

2.0 The Interlinkages

BHEL is inextricably linked with its environment. It may be worthwhile to see what type of inter-linkages these are, what is their impact on BHEL's performance, how has BHEL been managing these and what has been BHEL's influence over the environment through them.

2.1 'Public' accountability of BHEL is through the Parliament. Any member of the Parliament can ask the Government about any aspect of BHEL's performance. In addition, there are Parliamentary Committees which review BHEL's performance from time to time. While the Committee on Public Undertakings (COPU) makes a direct review of BHEL's performance, the Public Accounts Committee (PAC) reviews the performance of the Ministry and in doing so, reviews BHEL's performance.

2.2 As an 'enterprise' BHEL is accountable to DHI and to some extent BPE. It sends regular reports to both DHI and BPE. Secretary (Heavy Industry) takes a form of quarterly meeting when the operations of BHEL gets reviewed. In addition, BHEL is subjected to Governmental audit. There is a representative of the Finance Ministry on its Board who oversees that the Company follows the financial policies and the guidelines laid down by the Government. Similar function is discharged by other Government nominees on the Board in their respective areas.

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2.3 Approval for growth plans, technology import, export operations, resource allocation and appointment of senior executives for BHEL is done by the Government. It consults Government agencies in formulating major strategies like technology import, export operations, new location for its factories, industrial relations, aspects of compensation packages. Agencies which get involved during various stages include BPE, DHI, Finance Ministry, PIB, Public Enterprises Selection Board (PESB), Foreign Investment Board (FIB), Department or Industrial Development in the Ministry of Industry. Directorate General of Technical Development (DGTD), Department of Science & Technology (DST), Council for Scientific and Industrial Research (CSIR), Department of Economic Affairs (DEA), Department of Electronics, Department of Power, Central Electricity Authority (CEA). In addition, all other PSEs which may have an interest in the proposal are kept informed or consulted by the Government before taking the decision.

2.4 BHEL has a large number of transactions with other public undertakings or Government departments. These include its customers, suppliers, competitors and PSEs with whom it shares workload or forms joint ventures/consortiums in offering turnkey jobs within India and abroad.

2.5 BHEL employs about 60,000 people. Such a large work-force makes its interactions with them and the trade unions a very powerful interlinkage with local state governments.

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3.0 Management of Interlinkages

Setting up of BHEL was a decision of its environment. It was set up by the Government in response to a perceived need for an indigenous electrical equipment manufacturing unit. In the initial stages of project implementation, there was a dominant influence of the environment in the form of governmental agencies providing support to the project as well as monitoring and controlling its progress. BHEL sent regular reports to DHI, BPE, and Planning Commission. During late 1960s, as the projects neared completion and production started, expectations of the environment comprising the Parliament, Government, the Press and the people became very high. As it struggled through its teething troubles which are normal in this industry all over the world, BHEL/HEIL came under heavy attack for their poor performance. It became a whipping boy of the Press. There were talks of moth-balling the Hardwar plant.

Years that followed saw BHEL achieving its production targets. Service to the customer visibly improved. People started noticing and appreciating the performance. There was support and enthusiasm for its programmes in all quarters. It grew five-fold between 1972-77 and became a model public sector enterprise to be emulated by other enterprises both in public and private sectors. How did this come about ?

3.1 In retospect, it appears that what ailed BHEL most was the complete lack of information about it and the industry itself, in the environment. For example, National planners, while planning/monitoring the growth of heavy electrical industry did not appreciate its special characteristics like long gestation period, economies of scale etc. There was little knowledge or appreciation of what it takes to build an organisation like BHEL, or what efforts were being made by BHEL in this direction. Even country's requirements for power equipment were not clearly understood. Doubts were raised about creating too much capacity as the manufacturing units were being set up. In fact, some of the very senior Government officials considered Hyderabad plant to be superfluous and ill-equipped and suggested its abandonment. It was only when a proper picture was presented by BHEL to the Government agencies regarding the need for a plant to produce medium sized equipment and the universal nature of facility, the proposal was finally approved.

3.2 In another case, BHEL management went a step further. In 1968, Government was seriously considering the possibility of setting up another manufacturing plant for Boilers with the help of Combustion Engineering (CE) of USA. In addition, Government had asked General Electric (GE) of USA to explore the possibility of undertaking a comprehensive updating of technology in Indian heavy elctrical industry.

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Both of these events had major significance for BHEL. Implicit in them were threats to BHEL markets as well as challenge to its internal management. BHEL management decided to turn these events into opportunities for BHEL. It took up the case of the third manufacturer for boilers in the country (second manufacturer was already operating in the private sector) with the Government as well as Combustion Engineering. It was explained to them that a country like India could not afford three manufacturers for boilers. This industry had tremendous economies of scale. Cost of updating the technology was so high that too many manufacturers could not afford it. Capacity utilisation would be poor as the industry went through heavy fluctuations in demand. And, finally, it would be difficult for the new units to compete against BHEL. Combustion Engineering saw the point in BHEL's argument. They were willing not only to abandon the idea of setting up another plant in Indi but even went to the extent of suggesting that they would prefer joining hands with BHEL. Thus came about BHEL's technical collaboration with Combustion Engineering - one of the most successful cases of Technology Transfer in any part of the world.
(cf. A study commissioned by UNIDO, done by Prof Sisir Mukherjee of Indian Institute of Management, Ahmedabad).

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BHEL made a similar offer to GE. GE, however, could not appreciate BHEL's commitments to its existing collaborators. They insisted on BHEL terminating all its existing collaborations before they could offer their technology to BHEL. This, of course, was not possible and GE had to withdraw from a market which in later years was to grow into a highly lucrative market for World Heavy Electrical Industry. Ironically, GE once again fought to enter it in mid-70s and lost.

3.3 'Public' aspect of the public sector enterprise, perhaps, made BHEL highly visible. It attracted criticism when a similar organisation in private sector would have passed off as going through initial teething troubles. External criticism, particularly, from the Press, influenced the morale within the organisation creating demotivation and despondency. This in turn affected the performance, resulting in future criticism. There was an urgent need to break the vicious circle.

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People within the organisation were made to realise that the vicious circle could be broken only through team work and better performance. The employees rallied around. It was thought that a start could be made by making more and more people both within and outside the organisation know more about what BHEL was doing. As they came to know of the work being done, programmes being initiated, achievements and accomplishments made, and what BHEL means to the progress of the country, they started viewing BHEL in a different light. Hope and confidence replaced the fears and doubts. Soon the whole atmosphere was changed and a sense of pride was visible in all the employees.

3.4 Success is the key to good environment management. If you are perceived as a successful enterprise, an enterprise which makes things happen, 'public' part of the environment is likely to be more cooperative. BHEL took pains to communicate its plans as well as achievements. In fact, it went out of the way to keep the Government informed even when there was no formal requirement from the Government for doing so. Some of the monitoring and control systems which, today, exist in the Government are, perhaps, based on the initiative taken by BHEL.

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Some of the other PSEs also have done well in the heavy industry. But, they have always insisted on complete autonomy. Their plans and achievements have been their closely guarded secrets. They discouraged any interaction between the company executives and the Government officials. To that extent, there has been an almost total communication gap between them and the Government. Such a situation only hinders growth. There are delays in approvals and sanctions because the parties concerned have to understand each situation de novo. Many times, lack of total perspective can lead to unfavourable response to individual proposals.

It is difficult to say what prompted BHEL to adopt the approach it took at the time when the concept of public sector was still in its nascent stage. Management of public sector enterprise had not even been thought of as a unique concept. Both the enterprise and the Government were groppingin the dark to come to some style of management which would make this extremely powerful instrument in the hands of State for economic growth, effective. BHEL picked up professional management ideas and techniques, used them in its own operations and also passed them on to the Government through its interface with the latter. For example, techniques like PERT and MIS were introduced by BHEL to report its performance to the Administrative Ministry, BPE and the Planning Commission. Today, they are widely used by these agencies in monitoring and control of all new projects.

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3.5 It is not that BHEL has always been successful in managing its linkages. In case of a major collaboration agreement, which would have brought BHEL and the country to the forefront of technological leadership, BHEL could not make some of the Governmental agencies see its viewpoint. Only significant difference in the environment was that the country was passing through an unprecedented political crisis. Reverberations of this were echoing throughout the bureaucratic structure of the Government. The whole issue became a pawn in the political chess game. The organisation stepped up its efforts in informing the relevant environment about the need and justification of the proposal. It did achieve good success in its efforts at many stages. And, finally, the proposal is being cleared in segments. But, its essence and perspective were lost in the political turmoil. What is even more important is the fact that the organisation itself has been much bruised and tarnished in this effort. The edifice of mutual understanding and cooperation that was built between the organisation and its environment seems to have suffered a major setback, raising fresh doubts, misgivings and questions about the viability of the public sector in its wake. This in turn has affected coherence and dynamism within the organisation.

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Professional management in BHEL could, hitherto, remain independent of the political pressures because of the protective layer provided by the harmony and understanding reached between the Company management and the Government bureaucracy. But this layer has been ripped open by the intense political activity which the country has witnessed recently. It has once again brought the concept of public sector in India to a state of transition. Possibly, with stabilisation of political milieu, the relationship between public sector enterprise, the Government and the political forces may once again go back to the earlier state of harmony and understanding. Otherwise, the public sector experiment in India may be ready to enter the next stage in its evolution.

It started with creation of facilities as part of a macro-economic programme, matured into a professionally managed company, learnt to manage its linkages with formal administrative agencies in its environment and became a major instrument in the economic development of the country. So far, it has remained aloof from the political processes. The next stage may be the politicisation of this socio-economic concept. Like ENI group in Italy during the times of Mattei, it may come to wield political power as much as it may be influenced by it. It may become more public than enterprise - while goals of economic development demand that it be more 'enterprise' than 'public'.

3.6 In conclusion, it can be said that environment is really like an elastic canvas. If you want to paint big, you need a big canvas. So you keep extending your environment. There is almost no limit to how much you can manage. There are certain simple principles which you observe as you go along. Your influence over the environment is exerted through the information linkages you establish with it. Through these linkages you establish understanding. This comes by not only sharing your achievements but also your programmes, problems and difficulties. If the relationship is seen as constructive two-way and leading to mutual growth, it is more likely to be successful.

In case of BHEL, Government, Customers, Suppliers, Collaborators, Employees all were seen as partners in BHEL's growth. In fact, most of these have grown and matured with BHEL. There are many systems and procedures which were initiated by BHEL as solutions to some of its immediate problems have now become standardised in Government. Joint meetings with customers, suppliers to sort out pending problems is a common example. BHEL's concept of developing turnkey power projects and systems engineering capability has now matured into an independent organisation National Thermal Power Corporation. Perhaps the greatest recognition to BHEL's managerial capabilities has been the Government using its talents in its own functioning.