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ENGLISH

# HIGH-LEVEL ADVISORY SERVICES FOR THE ESTABLISHMENT OF AN ELECTRIC ENERGY RESEARCH CENTRE

SI/IRQ/85/805

IRAQ

Technical report: Assistance to the establishment of the Iraqi Electric Energy Research Centre (EERC)*

Prepared for the Government of Iraq
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of I. Berta, UNIDO expert
in collaboration with the National Team of the
State Organization of Electricity (SOE)

Backstopping officer: J. Fürkus, Engineering Industries Branch

United Nations Industrial Development Organization
Vienna

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## ABSTRACT

As a first step of the Project entitled "High Level Advisory Services For The Establishment Of Electric Energy Research Centre" (SI/IRQ/85/805) originated by UNDP Baghdad, August 1985, a UNIDO Expert (Electric Energy) worked from 13/09/86 to 9/11/86 in Baghdad. The Expert acted in co-operation with the National Team composed of State Organization of Electricity. Based upon the meetings, discussions and technical visits a Preliminary Project Proposal including the Organizational Structure, Work Plan and Preliminary Budget was elaborated and is now presented within this project report.

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## I INTRODUCTION

The rapid growth of energy demand and the accelerated power system expansion in Iraq justify the establishment of an Electric Energy Research Centre. The Iraqi Government, the Ministry of Industries and Minerals and State Organization of Electricity assign very high priority to this project and ensure all required local support.

According to the UNDP letter from UNDP Baghdad dated 06 08 1985 Iraqi Government requests an urgent assistance from UNIDO to provide high advisory input and guidance to the National Team (composed of the State Organization of Electricity) before the final decision on the Electric Energy Research Centre could be made.

Based upon the aforesaid during his two months mission the Expert

- studied in details the conditions, needs and aims of generation, transmission and distribution of electricity in Iraq,
- collected and analized the required data,
- formulated the objectives, activities and organization of the Electric Energy Research Centre

in co-operation with the National Team of Iraq composed of the State Organization of Electricity.

## II. DESCRIPTION OF THE WORK PERFORMED

### 1. ACTIVITIES

The Expert started his work in State Organization of Electricity, Head Office (Al- Jamhoriya Str. 166 near Al-Tayaran Square, Tel: 8880051) on 16th September 1986. After some initial discussions and gathering the basic background informations in co-operation with MR. NAMIR LABIB, the Expert met the National Team composed of SOE.

According the schedule worked out on the 1st National Team Meeting the Expert visited the different directorates of SOE:

- DG of Major Electrical Projects
  from 04 10 1986 till 08 10 1986,
- DG of Generation and Transmission of Electricity
  from 11 10 1986 till 16 10 1986,
- DG of Baghdad Distribution
  from 20 10 1986 till 22 10 1986.

After several technical visits and personnel discussions with DR. GAZI DARWISH (Special Adviser to the Minister of Industry and Minerals) and with the Memebers and Invited Members of the National Team the Preliminary Project Proposal was drawn up. The material containing the proposal of the Expert and the National Team was finished after the 2nd and 3rd meetings with the National Team.

2. NATIONAL TEAM OF IRAQ

COMPOSED OF SOE

DR. MAHSEN SHLASH * — CHAIRMAN

Head of the Planning and Studies Department

Head Office

MR. NAMIR LABIB

Chief Engineer

Planning and Studies Department

Head Office

MR. MOHAMMED A. JABIR

Chief Engineer

DG of Generation and Transmission of Electricity

Head of Transmission Department

MR. AHMED AZIZ SHIHAB

Chief Engineer

DG of Generation and Transmission of Electricity

Generation Department

DR. BAHJAT K. HASSAN

Chief Engineer

DG. of Major Electrical Projects

MR. HAMZA AL NAJJAR*

Chief Engineer

DG ot Major Electrical Projects

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* DR SHLASH and Mr. NAJJAR were absent during the two months mission of the Expert.

3. INVITED MEMBERS OF THE NATIONAL TEAM

MR. AMER AL - RAWI

Chief Engineer

DG of Baghdad Distribution

MRS. MAY AHMED

Chief Engineer

Deputy Head of the Planning and Studies Department

Head Office

MR. H.S. AL-HANI

Chief Engineer

DG Generation and Transmission of Electricity

MR. KAMIL AL - MASHTA

Distribution Expert

Head Office

MR. THAER E. YAALOUB (Deputy of MR HAMZA AL NAJJAR)

Architectural Engineer

DG of Major Electrical Projects

4. DISCUSSIONS

Discussions were held with the following experts of power engineering and research work

- DR. GAZI DARWISH

  Special Adviser to the Minister of Industry and Minerals

  (05 and 19 10 1986)

- National Team composed of SOE

  1ST Meeting

  (25 09 1986)

  2ND Meeting

  (26 10 1986)

  3RD Meeting

  (03 11 1986)

- Personnel Meetings

  with the Members and Invited Members of the National Team

  (for several times during the two months of the mission)

- H.Y.ZEKI

  President of State Organization of Electricity

  (11.08.1986.)

## 5. TECHNICAL VISITS

Visits were payed to the following factories, power stations, substations and laboratories.

- Industrial Complex Diala

  Transformer Factory, Baquba

  (04 10 1986)

- Specialized Institute for Engineering Industries (SIEI), Baghdad

  (09 10 1986)

- Dora Thermo Power Station, Baghdad

  (12 10 1986)

- Baghdad West 400/132 KV Substation

  (13 10 1986)

- Baghdad, University 132/11 KV Substation, GIS

  (14 10 1986)

- Hydro Power Station, Samarra

  (16 10 1986)

- Two 33/11 KV Substations, Baghdad

  (20 10 1986)

- Laboratories and Workshops of DG Baghdad Distribution

  (20 10 1986)

- Mobile Laboratories of DG Baghdad Distribution

  (21 10 1986)

## III RECOMMENDATIONS

Based on the Preliminary Project Proposal on the "Assistance to the Establishment of the Iraqi Electric Energy Research Centre" (see Appendix) elaborated by the Expert and the National Team it is recommended that:

(1) The Electric Energy Research Centre (EERC) be established with 5 Departments, 15 Sections, 10 Laboratories, Computer Centre, Technical Library and Workshops as shown in Annex I.

(2) The EERC be implemented over a period of 5 years in accordance with the initial work plan as proposed in Annex II.

(3) The technical assistance to the establishment of EERC, i.e. expertise, training of the National Staff and selected equipment related to the expertise component be implemented by UNDP/UNIDO and all other requirements (National Staff, Infrastructure etc.) be provided by the Iraqi Government and covered by respective financial contributions as indicated in Annex III.

Dr. Gazi Darwish, the Special Adviser to the Ministry of Industry and Minerals proposed to continue the detailed preparatory work in the first half of 1987.

## IV. ACKNOWLEDGEMENTS

The Expert would like to express his thanks to DR. GAZI DARWISH and all of the Members and Invited Members of the National Team. MR. NAMIR LABIB, MR. MOHAMMED A. JABIR, MR. AHMED AZIZ SHIHAB, DR. BAHJAT K. HASSAN, MR. H.S. AL- HANI and MR. AMER AL - RAWI made especially large contribution but the Expert is also grateful to MR. KAMIL AL - MASHTA, MR. THAER E. YAACOUB and MRS. MAY AHMED.

All the advice and suggestions of MR. STEVAN BURANJ are gratefully acknowledged and the co-operation of the Staff of UNDP Office is also very much appreciated.

## V EXPLANATORY NOTES

Abbreviations:

| | |
|---|---|
| AC | Alternating Current |
| CTA | Chief Technical Adviser |
| DC | Direct Current |
| DG | Director General |
| EERC | Electric Energy Research Centre |
| GIS | Gas Insulated Substation |
| HP | High Power |
| HV | High Voltage |
| ID | Iraqi Dinars ($1 = ID 0.31) |
| NT | National Team |
| PC | Personnel Computer |
| SOE | State Organization of Electricity |

## VI - APPENDIX

### PRELIMINARY PROJECT PROPOSAL ENTITLED

### "ASSISTANCE TO THE ESTABLISHMENT OF THE IRAQI ELECTRIC ENERGY RESEARCH CENTRE"

Table of Contents

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of

IRAQ

PROJECT DOCUMENT

| | |
|---|---|
| Title: | Assistance to the establishment of the Iraqi Electric Energy Research Centre (EERC) |
| Project Number: | |
| Primary Function: | Institution Building |
| Secondary Function: | Direct Support for Industry |
| Sector (Govt. Class): | Industry |
| Sub-sector: (Govt. Class) | Energy |
| Government Implementing Agency: | Ministry of Industry and Minerals, State Organization for Electricity (SOE) |
| Executing Agency: | United Nations Industrial Development Organization (UNIDO) |
| Estimated Starting Date: | 1988 |
| Government Inputs: (in kind) | ID 12,362,000 UNDP Inputs: $6,724,000 |

Signed: _____ Date: _____
(on behalf of the Government of India)

_____ Date: _____
(on behalf of the Executing Agency)

_____ Date: _____
(on behalf of the United Nations Development Programme)

## 1. OBJECTIVES

### (a) Development objectives

The rapid growth of energy demand of Iraq and the accelerated power system expansion involving huge amounts of capital investment and running costs justify establishment of an Electric Energy Research Centre (EERC).

The following capabilities and facilities are the most important as long range objectives of the present project:

- to increase the productivity of power industry,
- to increase higher reliability of the energy system,
- to achieve the optimal capacity utilization in power industry
- to create indigenous capacity to adapt. design and manufacture electric energy equipment,
- to increase the benefit of the power engineering industrial production,
- to improve the quality of production in the related industries,
- to decrease the import needed for power industry by increasing the scientific, technical and experimental co-operation with developed countries.

Systematic and analytical study is needed that integrates the economical and technological aspects of power industry development and to clear perspective of objectives and future direction for developing.

The Iraqi Government aims to achieve the aforesaid development objectives partly through establishing the Electric Energy Research Centre(EERC) during the National Development Plans for 1986-1990 and 1991-1995.

(b) Immediate Objectives

The basic immediate objectives of the project are as follows.

- To establish a Research Centre providing scientific and experimental assistance to an optimum development and operation of the Iraqi power industry.
- To establish research laboratories achieving high-level technology, quality control and reliability services in electric power generation, transmission and distribution.
- To establish and develop a special information and documentation system and Technical Library for serving the needs of power industries.
- To introduce standards for EERC in accordance with local conditions, local standards and standards used by Iraqi power industries.
- To provide training for the staff of the experimental laboratories in industrially advanced countries for improving
  - = international co- operation,
  - = local interinstitutional co-operation,
  - = local training and
  - = assisting local maunfacturing.
- To study the requirements of power industries and related industries in the country and to develop the Work Plan accordingly.

2. SPECIAL CONSIDERATIONS

- By strengthening of technical co-operation between Iraq, and the developed countries through consultations, training programmes, fellowships, study-tours etc. the project will improve the culture of work and the working milieu in the very important field of power engineering.

- The project will also contribute to increase co-operation between Iraq and the developing countries (research, study and testing works for different countries and companies in co-operation or on commercial basis).

3. BACKGROUND AND JUSTIFICATION

- Electricity is a vital element for development. Demand of electric power is increasing all over the world. Average electricity consumption growth rates especially for the developing world regions. The power sector claims one of the largest shares of public investment in most developing countries.
- In order to meet the growing demand on electric power in Iraq, the Government assigns a very high priority to power industry. In order to meet the electrical loads at present time and for the future gas , Thermo and hydro - electrical power stations have been constructed in various parts of the country. 400KV ultra high voltage transfer network and 132KV high tension lines have been constructed to link all parts of the country. In addition there are distribution networks on medium voltage (33KV and 11KV) and on low voltage (0.4KV) in the cities.

  The first stage and most of the second stage of electrification of the country have been finalized.

- The level and the volume of the network which has been accomplished, and the priority according, indicate the necessity of establishing a specialized Electric Energy Research Centre (EERC). The Ministry of Industry and Minerals is intending to establish the EERC as soon as possible. So the EERC - attached to the President of State Organization of Electricity(SOE) - has to be able to guide and control technically the progress of the electrification programme in Iraq, particularly in the field of generation, transmission and distribution of electricity.
- SOE has already started the following activities concerning the establishment of EERC.
  = A National Team (NT) was composed of SOE (March 1986)
  = A preliminary proposal was given entitled "The Iraqi Research Centre for Electric Energy" (November 1979).
  = SOE has got already some laboratories corresponding to EERC. These laboratories, belonging to the various Regions of the networks,are prepared only for simple service tasks (testing relays and other equipments of maintenance, simple high voltage tests made by small portable equipments etc.). In the frame of EERC well organized and equipped research laboratories( beyond the Regions of the network),are to be established.
- The following are some important aspects relevant to the establishment of Iraqi EERC.
  = Qualitative tests for various instruments and electrical equipments are now carried out abroad. Operating of EERC on this field will save a great amount of hard currency. These test will be done for local and other establishments in co-operation or (at a later stage) on commercial basis.

= EERC provides the possibility of carrying out research work in order to develop the electricity system of the country.

= The local conditions in transfer and distribution of electric energy, e.g. weather conditions, entirely differ from that of other countries. This makes the field of local research essential for getting acquainted with the reaction of the equipment (both imported and locally developed) to this environment and subsequently to work out the technical specifications and standards accordingly.

= EERC may comprise of other areas for the purpose of theoretical and experimental studies, research and services by utilizing computer and various laboratories. So on one hand the quality of production in the related industries can be improved, on the other hand EERC will significantly improve the technical and socio-economic development of the whole local industry.

According to the aforesaid the technology to be acquired cannot be developed without external assistance and its transfer and adaptation shall enable the country to improve substantially existing engineering capacities in the field of electricity.

Iraqi Government requests urgent assistance from UNIDO to provide high advisory input and guidance throughout the present project for establishing EERC.

Iraqi Government assigns very high priority to this project and ensures all required local support.

Because of the special importance of generation, transmission and distribution of electrical energy, the responsible authorities of the country wish to take full advantage of the experience of the United Nations Industrial Development Organization in both of the fields of power industry and the establishment of industrial research and service institutes.

## 4. PROJECT OUTPUTS

In accordance with the Immediate Objectives of the Project, the following outputs will be achieved:

- EERC capable for carrying
  - = theoretical and experimental research,
  - = experiments and test for optimum design,
  - = specific system studies,
  - = type, routine and special tests,
  - = laboratory and site measurements,
  - = training of local staff,
  - = organizing conferences

  in the field of generation, transmission and distribution of electric energy (by the end of 5 years of project operation).

  The number of the staff should reach 320, including 77 graduate engineers. (The annexed Organizational Structure of the EERC contains also detailed Personnal Charts).
- Establishment of the following departments in EERC
  - = Electrical Engineering Department,
  - = System Engineering Department,
  - = Technical Department,
  - = Studies, Information and Training Department,
  - = Administrative and Finantial Department,

  (by the end of 1 year of project operation).

- Setting up of 10 laboratories on
  - = high voltage(indoor,open space and mobile) (by the end of the 3rd and 4th year)
  - = high power (by the end of the 4th year),
  - = synthetic testing (by the end of the 5th year),
  - = secondary equipment testing (by the end of the 3rd year),
  - = transient network analyser (by the end of the 4th year),
  - = calibration and testing (by the end of the 3rd year),
  - = insulating materials (by the end of the 3rd year),
  - = mechanical testing (by the end of the 5th year),

  for research, testing and training purposes.
- Computer Centre for carrying out of all types of studies in the field of power engineering (by the end of 3 years of project operation).
- A special Technical Library and documentation unit, having necessary periodicals, bulletins, books and storing the industrial informations on a later stage in computer (after 2 years of project operation).
- Centralized Workshops for assembling and preparing heavy equipments for tests and for repairing and manufacturing testing and measuring equipments (after 2 years of project operation).
- Identification of priority areas and establishment of applied research programmes.
- Trained technical staff of EERC including
  - 188 man/month fellowships and
  - 42 man/month study tours.
- Syllabi for courses in the field of high voltage and high current testing and measuring techniques.
  (by the end of the 3rd year of project operation)

- Preparation of Internal Standards for EERC in closed connection with National and International Standards and Regulations.
- Anually publication of the Bulletin of EERC containing research activities and the latest technical reference materials for power engineering.
- Technical reports related to Project Outputs will be collected and prepared by the Chief Technical Adviser and submitted to the UNDP Resident Representative and UNIDO Headquarters, with sufficient amount of copies for distribution to the Government authorities con erned.

5. PROJECT ACTIVITIES

(SEE ANNEX II WORK PLAN)

(a) Recruitment of Management and Technical National Staff of EERC.

(b) Recruitment of international Experts and Consultants.

(c) Training of National Staff, preparation and implementation of fellowships and study-tours.

(d) Design and completion of construction of the buildings.

(e) Preparation of specifications and ordering of laboratory and workshop equipments. Installation and testing equipments.

(f) Set up Departments,

Sections,

Laboratories,

Computer Centre,

Technical Library and Workshops.

(g) Preparating syllabi and standards, organizing seminars and conferences, editing reports, publications and bulletines.

(h) Putting into operation EERC.

(i) Reporting

A more detailed breakdown of activities is given in Annex II (work plan).

## 6. INPUTS

The technical assistance of the establishment of EERC i.e. expertise , and selected equipment related to the expertise component, training of the National Staff shall be implemented by UNDP/UNIDO and all other requirements (National staff, Infrastructure etc.) be made available by Iraqi Government as follows:

(a) Government Inputs

(i) PHYSICAL FACILITIES AND EQUIPMNT

- The Government will provide territory and buildings with all necessary premises sufficient for the needs of the Project( ID 5.026.000 ).
- The Government will also provide all necessary equipments, instruments, tools and supplementary facilities needed for service and research work of EERC (ID 3.700.000 ).
- The Government will further provide all necessary technical publications (books, periodicals etc.) required for both service and research work of EERC (ID 100,000).
- The Government will provide all necessary offices, transport and communication equipment and inventory (including furnished and equipped offices for the UNIDO Staff and vehicles with drivers for transportation of UNIDO Experts and Consulants).
  (ID 334,000)
- The Government will finance all expenditures required for the normal running of EERC during 5 years of Project Operation.
  (ID 750,000)

(ii) ASSIGNMENT OF NATIONAL STAFF

- The Government manpower inputs are set out in details in the Project Budget (see Annex III).

  The total number 320,

  total man/month in 5 years of project operation 11460 and

  total cost of manpower amounts to ID 2,307,960.

- The Government will provide the travel allowance in Iraq. The total provision for this purpose is ID 56,000.
- Besides the fellowships and study-tours proposed to provide for the National Staff by UN System the Government would provide additional training. The main purpose is to give on- the- job training for the staff of the laboratories and workshops on utilization and maintenance of equipments. The total amount for this training is ID 88,000.

(b UNDP Inputs

(i) Assignment of International staff

- 390 man/month service of international Experts,
- 44 man/month short term consultancy services.

  (All of the details on Experts and Consultants are given in Annex I/8).

(ii) Training

- Fellowships and study tours
  - 30 individual fellowships of 6 months each,
  - 14 study - tours of 3 months each and
  - 8 months of fellowships for the members of the National Team for formulating the final requirements after signing the Project Documents.

The total training provisions during Project Operation amounts to 230 man/months (see Annex I/7).

- The technical staff of EERC awarded with fellowships should be sent in wellknown institutions and factories for training on the job in their fields of specialization.
- The management staff of EERC awarded with study-tours should be sent to wellknown institutions and companies to get acquinted with the organization structure and the work carried out in their fields of specialization.
- The programms for both the fellowships and study-tours will be planned by the Chief Technical Adviser in agreement with the Director General of EERC in the Work Plan.

(iii) Equipment

- A part of equipments closely connected to the work of UNIDO Experts and Consultants (scientific calculators, personnel computers, transient network analyser, simulators for training, software packages, typewriters and word-processors, equipments necessary for data bank and technical library etc.) is proposed to be implemented by UN System.
- The detailed specifications of these equipments will be given by the Chief Technical Adviser in agreement with the Director General of EERC.
- The total value of these equipments during 5 years of Project Operation is US $880.000. (see Annex III).

(iv) Miscellaneous

A part of miscellaneous costs is proposed to be implemented by UN System in total value of US $ 170.000. Such as reporting costs and sundry expenses.

(v) Support personnel and other costs

The service of necessary support personnel as well as provisions for mission costs and travel of Experts and Consultants are proposed to be implemented by UN System.

## 7. FUTURE UNDP ASSISTANCE

According to the achievements of the present Project and the future Development Plans of Iraqi Government, possible future assistance has to be discussed before the completion of this Project.

ANNEX I - ELECTRIC ENERGY RESEARCH CENTRE

1. INSTITUTIONAL FRAMEWORK

(i) Electric Energy Research Centre(EERC)will be a special industrial service and research institute. In this field services mean application of existing knowledge:engineering, testing and analysis surveys,feasibility studies etc. and research means acquiring new knowledge by laboratory experiments and theoretical investigations.

(ii) EERC will be a mono- branch institute serving mainly the power industry of the country by carrying services and both short - term (tactical) and long - term (strategic) applied research.

(iii) EERC will be an autonomous body attached through the President of STATE ORGANIZATION OF ELECTRICITY to the Minister of Industry and Minerals or to the person representing the Minister in his authority (hereinafter referred to as the Minister of Industry and Minerals).

(iv) EERC will be a centralized institute with

- Board of Directors (first stage: National Team),
- Director General/ National Project Director,
- Basic engineering and supporting staff,
- Separate budget financed by the Government,
- Fenced area,
- Own buildings,
- Own laboratories,
- Computer Centre,
- Technical Library and,
- Workshops.

(v) SOE attached to the Ministry of Industry and Minerals will be nominated as the Goverment executing agency for the implementation of the project of establishing EERC in Iraq.

(vi) SOE the central Government organization for power industry will be the main user of both the Project's and EERC's results, however these results will also be available for later utilization in power engineering field of other state industries as well as in other branches of industry both mixed and private sector in Iraq.

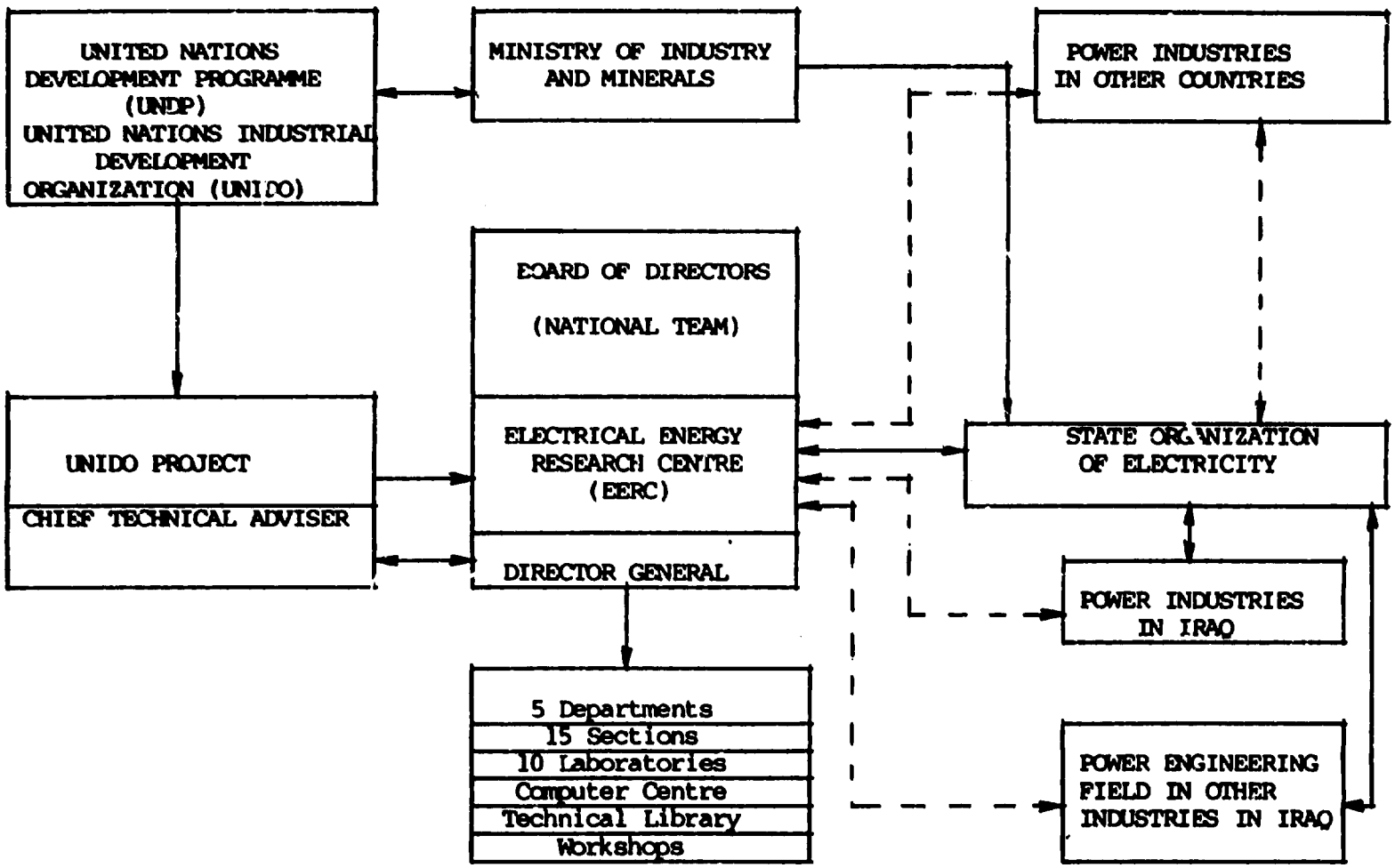
(vii) The computer aided activities (scientific computations, computer aided design and computer aided manufacturing, CAD/CAM) are extremely important for both of the services and research of EERC. The Iraqi Government, the Ministry of Industries and Minerals and SOE are taking very effective measures for introduction and wide use of computer, the development of computer aided capabilities and facilities.

(viii) EERC will be built up in a fenced,pollution free area of about 120000$m^2$ near Baghdad city, as near as possible to a 400/132KV substation, with

- appropriate road and railway connections for transportation of heavy equipments;
- suitable electric power connections (substation nearby having high short-circuit power);
- electric power supply, electromagnetic shielding of the buildings, earthing, water supply,sewage drainage, air compressor, cooling and heating system, lightning protection;
- central building:
  - = 1 Lecture Hall (for 200 persons),
  - = 3 Meeting rooms (for 20 persons each),
  - = Computer Centre,
  - = Technical Library,
  - = Offices for management and administrative personnel,
  - = rooms for scientific and technical staff;

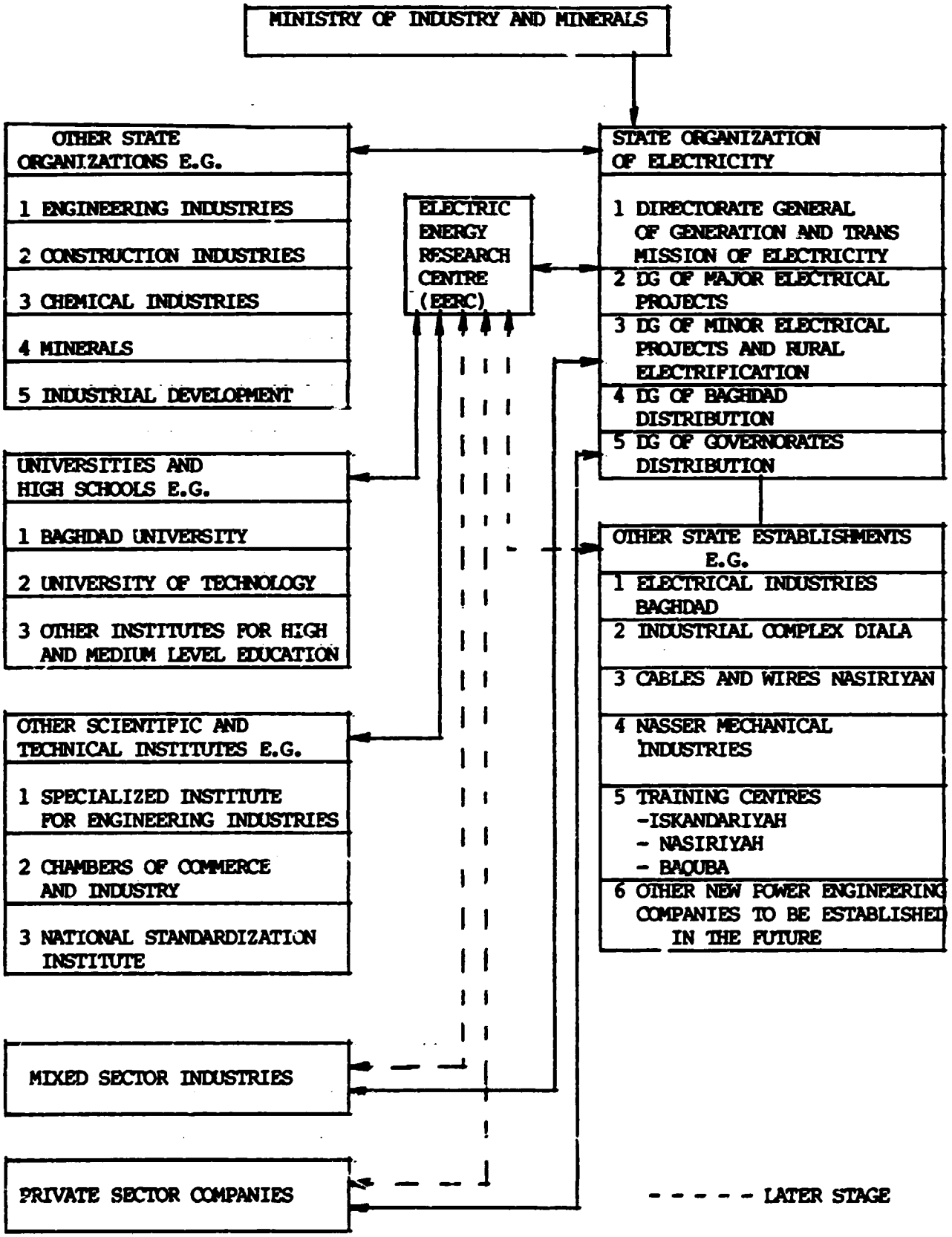
- technical buildings:
  = laboratories;
  = workshops;
- open space high voltage laboratory;
- services:
  = stores,
  = restaurant,
  = buffet,
  = cars,
  = garage,
  = garden,
- miscellaneous
  = gates,
  = reception building,
  = walking roads in open green areas,
  = parking areas for cars,
  = guest - houses.

2. SCHEMATIC CHART OF THE ESTABLISHMENT OF EERC




- - - LATER STAGE

3. RELATIONSHIPS OF EERC WITH INDUSTRIAL ESTABLISHMENTS IN IRAQ



## 4. ACTIVITIES OF EERC

Main fields of activities of EERC are to be as follows.

(i) Technical Activities

- Theoretical and experimental research and services in different fields of generation, transmission and distribution of electric energy, particularly in the fields of national importance (e.g. effect of local climate and environment on behaviour of various electrical equipments).
- Specific theoretical studies to assist planning and operation of both networks and equipments.
- Experiments and tests for optimum design and manufacturing of electrical machinary providing national basis for present and future national manufacturing.
- Type, routine and special tests of various home made or imported electrical equipments e.g.
  - = power transformers
  - = shunt reactors,
  - = generators,
  - = motors,
  - = circuit breakers,
  - = disconnecting switches,
  - = potential and current transformers,
  - = surge arresters and protective gaps,
  - = underground cables and power capacitors,
  - = miscellaneous electrical equipments
    (earthing resistances, serries reactors,relays etc.)
  - = insulators
    (post insulators, pin-type insulators, strings, synthetic insulators etc.)
  - = conductors and accessories,
  - = overhead line tower structures.

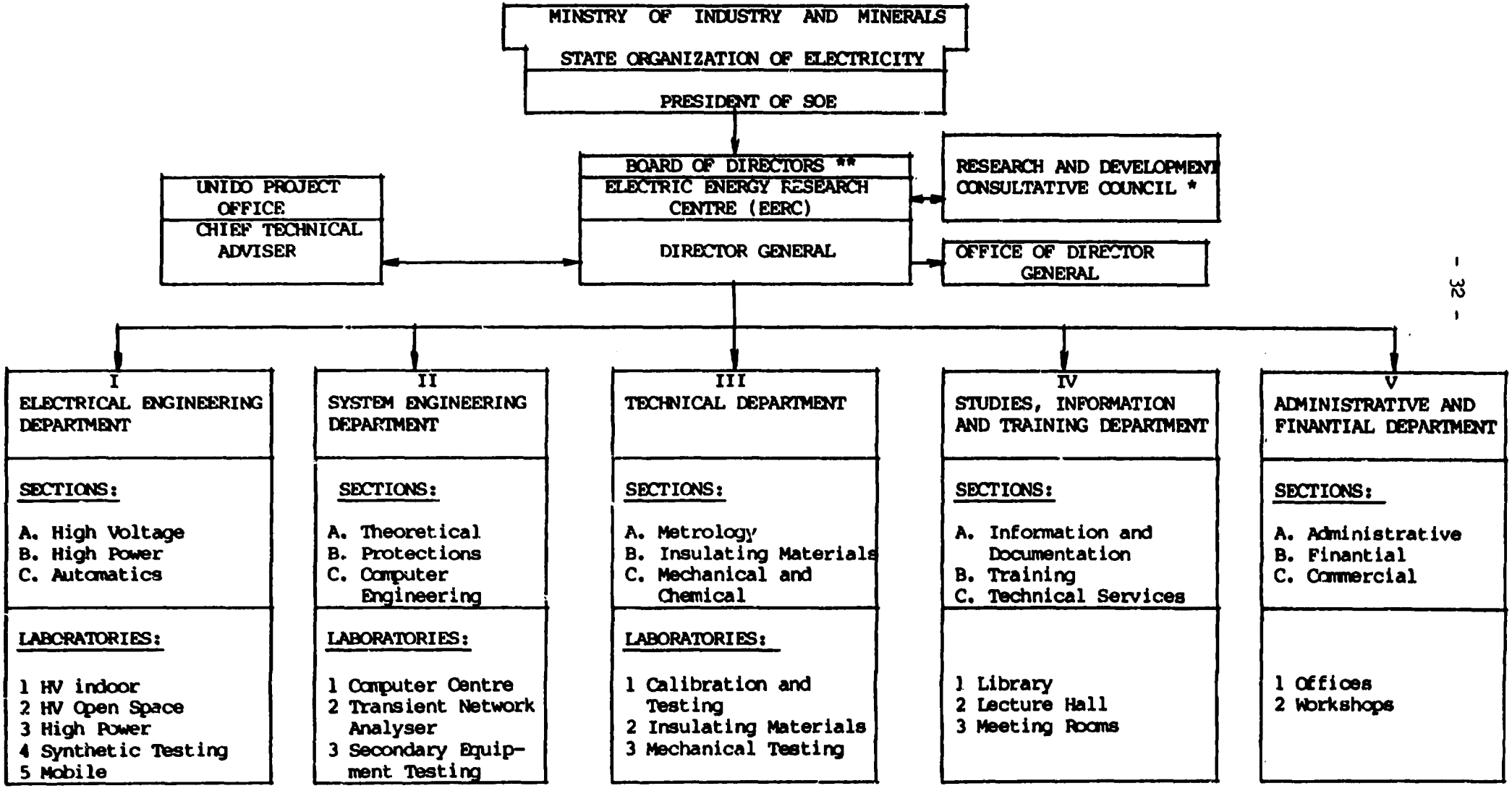
- Laboratory and site measurements of
  - = electric field strength,
  - = high voltage and
  - = current,
  - = pollution,
  - = TV. and radio interference.
- Basic follow- up research in
  - = water treatment,
  - = combustion engineering (fuel and oil testing),
  - = nuclear power engineering,
  - = corona losses,
  - = corrosion (steel earthing conductors),
  - = gas discharges in long air gaps,
  - = lightning protection of power stations, transmission lines and substations with special consideration of protecting control and computer systems.
- Research, study and testing works in the laboratories (including mobile laboratories) for SOE, for various institutes, local companies, foreign countries and companies in co-operation or on commercial basis (at a later stage).

(ii) Supplementary Activities

- Information and Documentation
  - = information
  - = documentation,
  - = library,
  - = data bank
  - = standardization,
  - = technical translation,
  - = editing and publication.

- Training:
  - = training of the staff,
  - = local training,
  - = fellowships and study-tours,
  - = special training courses.
- Organizing and holding national and international
  - = conferences and
  - = symposia.

5. THE ORGANIZATIONAL STRUCTURE OF THE ELECTRIC ENERGY RESEARCH CENTRE



*) RESEARCH AND DEVELOPMENT CONSULTATIVE COUNCIL

| | |
|---|---|
| MEMBERS : - DIRECTOR GENERAL | 1 |
| - CHIEF TECHNICAL ADVISER | 1 |
| - DIRECTORS | 5 |
| - HEAD OF THE COMPUTER CENTRE | 1 |
| - HEAD OF THE LIBRARY | 1 |
| - HEAD OF THE WORKSHOPS | 1 |
| - PROMINENT INDUSTRIAL AND ACADEMIC PERSONNELS | |
| - INVITED SPECIALISTS FROM ABROAD | |

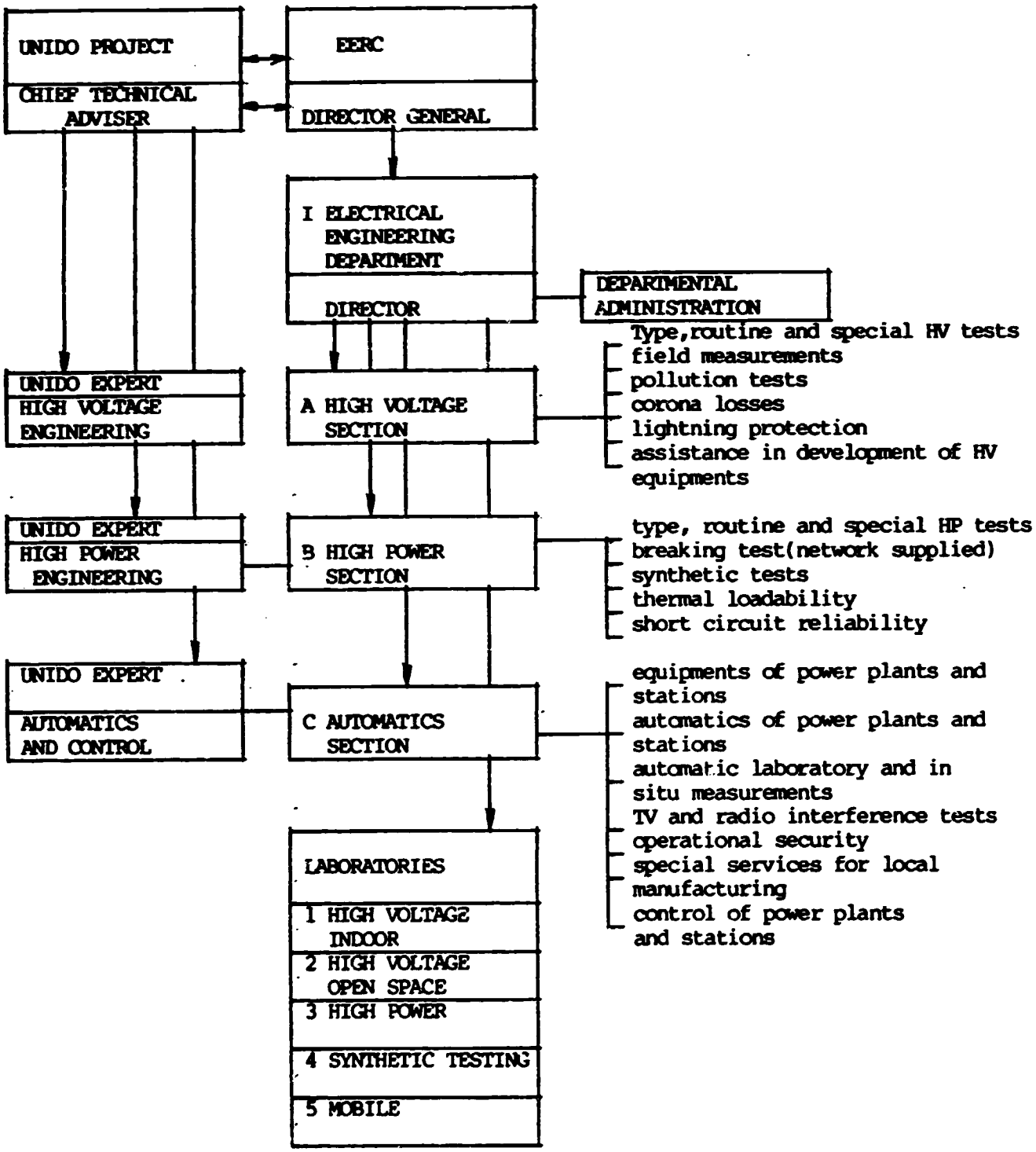
TOTAL NUMBER: NOT MORE THAN 20

**) BOARD OF DIRECTORS

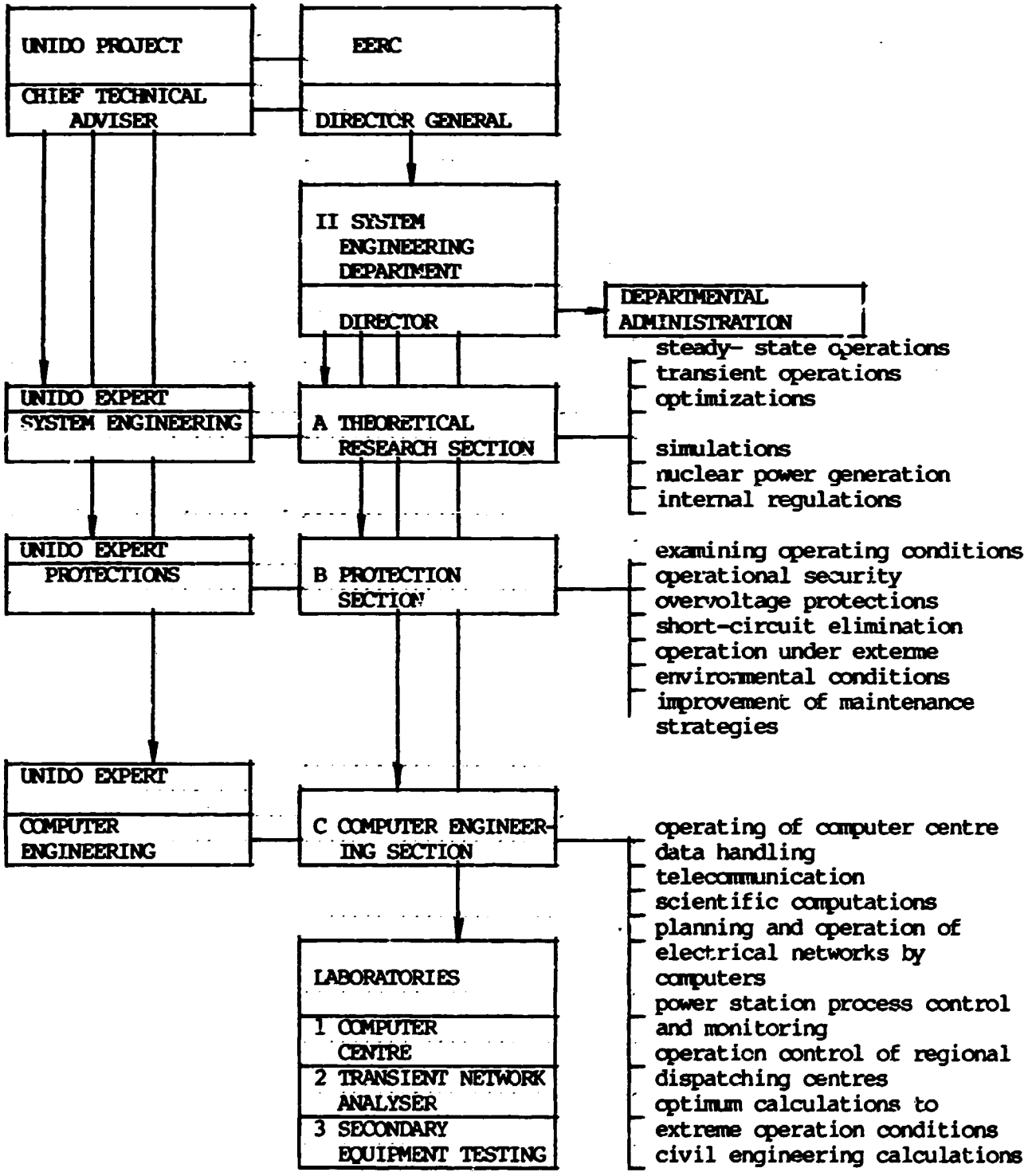
| | |
|---|---|
| MEMBERS: - PRESIDENT OF SOE (CHAIRMAN) | 1 |
| - DIRECTOR GENERAL (DEPUTY - CHAIRMAN) | 1 |
| - NATIONAL TEAM (FIRST STAGE) | 6 |
| - MEMBERS APPOINTED BY IRAQI GOVERNMENT | |

TOTAL NUMBER ; 7 (FIRST STAGE), 11 (LATER STAGE)

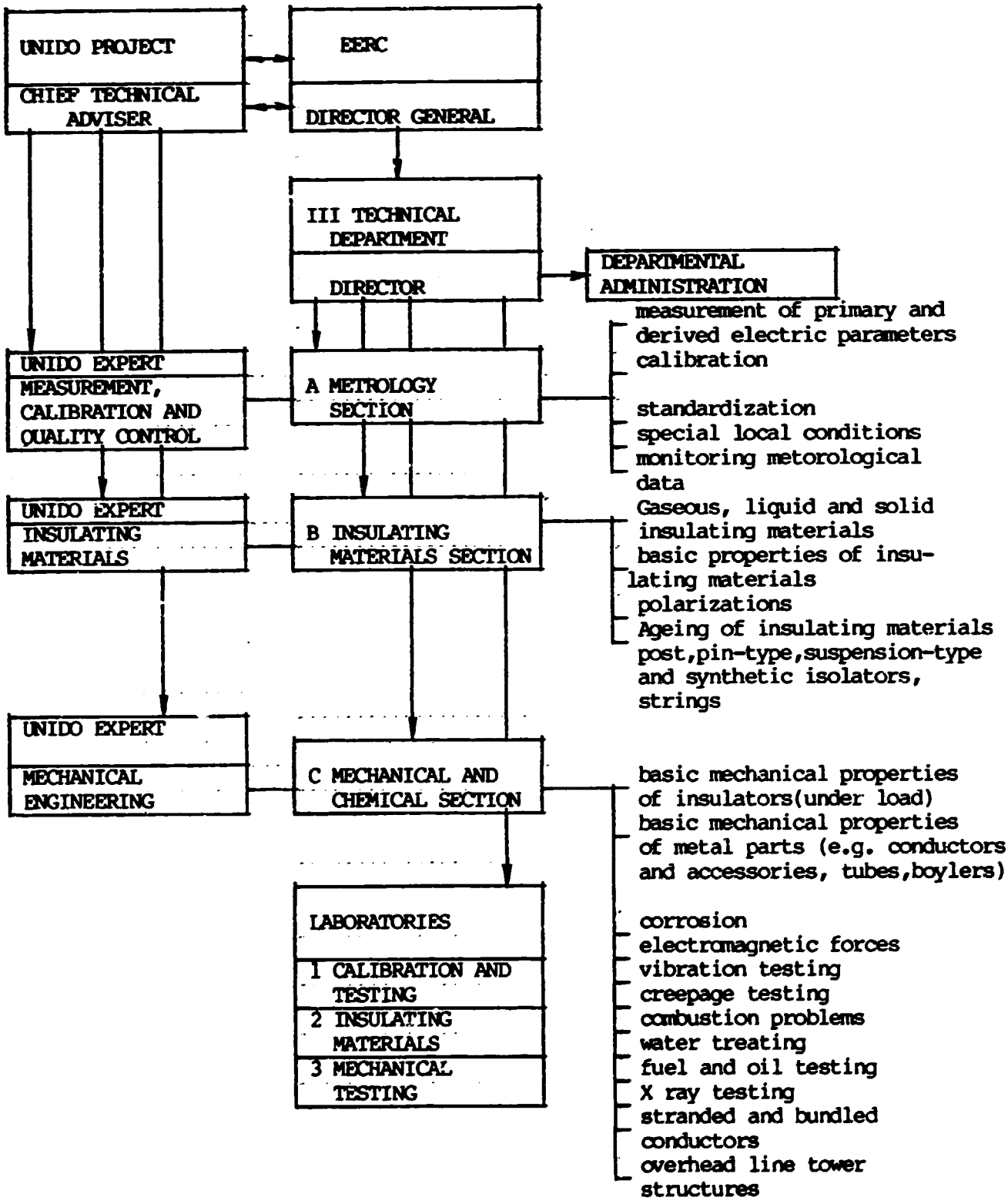
SCHEMATIC CHART OF THE ELECTRICAL ENGINEERING DEPARTMENT



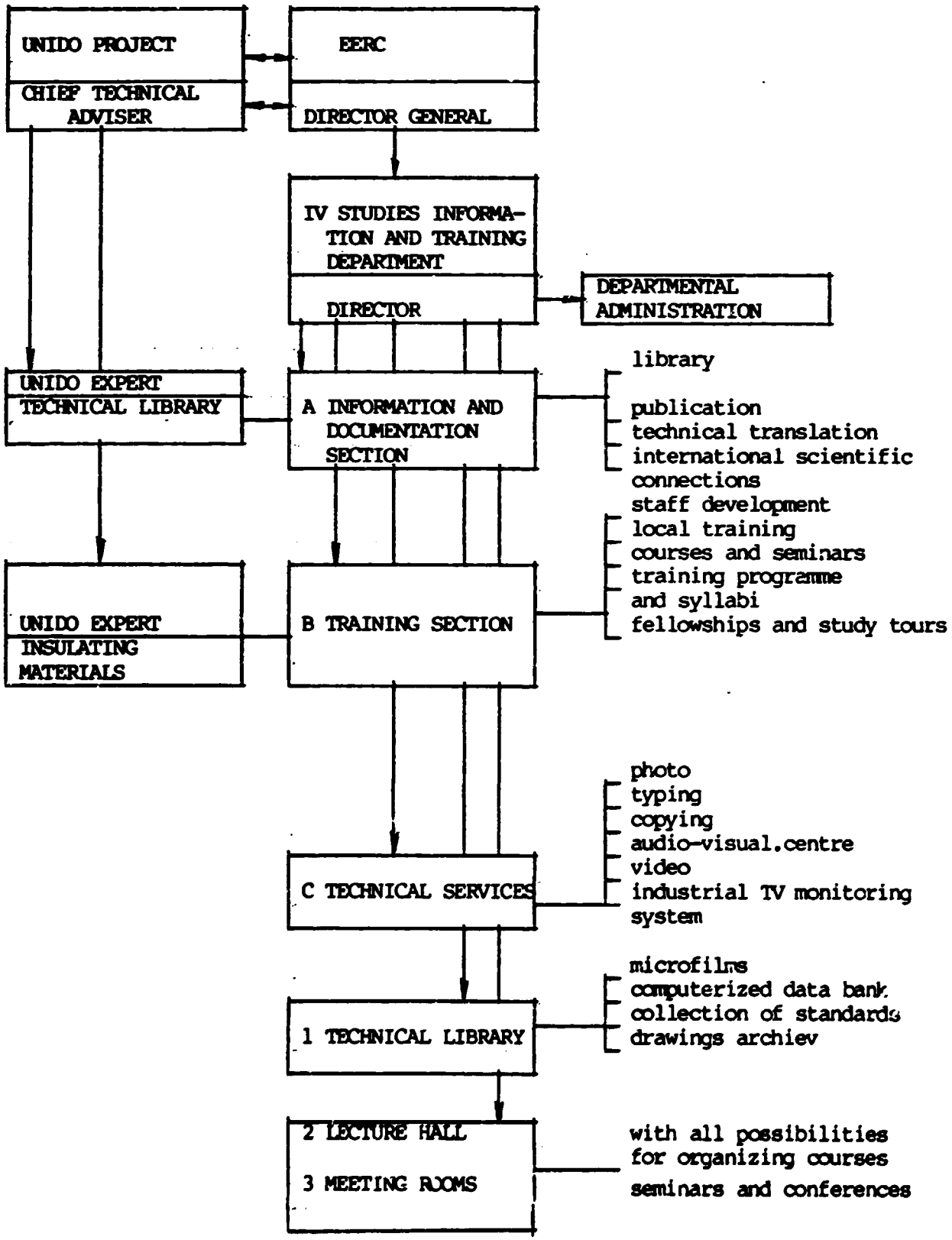
SCHEMATIC CHART OF THE SYSTEM ENGINEERING DEPARTMENT



SCHEMATIC CHART OF THE TECHNICAL DEPARTMENT

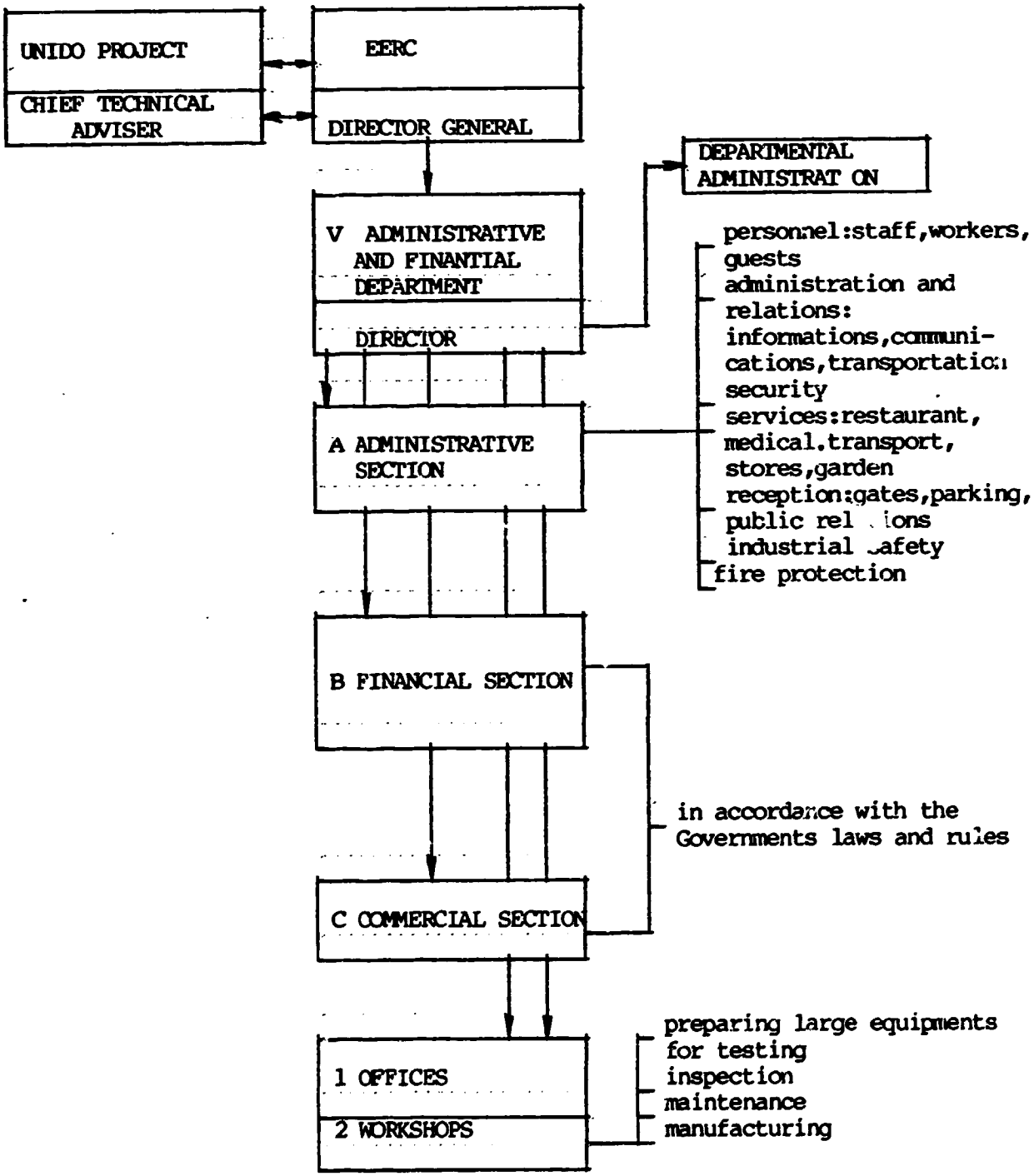


SCHEMATIC CHART OF THE STUDIES, INFORMATION AND TRAINING DEPARTMENT



SCHEMATIC CHART OF THE ADMINISTRATIVE

AND FINANTIAL DEPARTMENT



## 6 BASIC REQUIRED EQUIPMENTS IN VARIOUS LABORATORIES *

### I/1 HV INDOOR LABORATORY

| | |
|---|---|
| - Transformer | = 600KV 1000KVA |
| - Impulse Generator (for both standard and switching impulses) | = 1000KV 50Kj |
| - DC Voltage source | = 500KV 100mA |
| - Increased frequency operating set | = 6KV 1000KVA 200Hz |
| - Fog chamber | = 5m x 5m x 9m 400KV 200KVA |
| - Voltage deviders, shunts, oscillographs, roof and wall bushings | |

### I/2 HV OUTDOOR LABORATORY

| | |
|---|---|
| - Impulse Generator | = 1500KV, 100Kj |
| - Direct network supply for short - circuit tests | = connection to 400/132KV substation having high short-circuit power |

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*) Detailed data will be worked out by the Director General , Chief Technical Adviser, National Team and UNIDO Experts and Consultants till the end of 1st year of project operation

I/3 HP LABORATORY

- Short - circuit breaking capacity testing set
- Circuit - breaker testing set = inductive and capacitive current interruption
- Surge arrestor testing set = for impulse, long duration current and operation duty
- Temperature rise testing set = for transformers, circuit breakers and isolators

I/4 SYNTHETIC TESTING LABORATORY

- Synthetic circuit breaker testing equipment

I/5 MOBILE LABORATORIES

- Impulse generator = 200KV
- DC Voltage Source = 120KV
- Transformer = 90KV
- Transformer oil testing equipment
- Basic measurements of meteorological data
- High current primary testing

II/1 COMPUTER CENTRE

- High capacity main digital computer
- PCs connected to main computer
- Alphanumerical data- base handling system
- Terminals, discs, plotters, grafical services

- Software packages for
  - = system reliability and planning
  - = optimal generation (water, gas, oil) and tranmission planning
  - = machine and network transient analysis,
  - = load flow and growth forecasting,
  - = relay scheme and coordination,
  - = audiofrequency ripple- control system,
  - = digital remote - control system.

II/2 TRANSIENT NETWORK ANALYSER LABORATORY

- Transient network analyser
- Control units
- Recording units

II/3 SECONDARY EQUIPMENT TESTING LABORATORY

- Relay testing sets
- Accuracy measuring sets = for voltage and current transformers

III/1 CALIBRATION AND TESTING LABORATORY

- Highly sophisticated instruments of high accuracy for measuring basic electrical parameters = voltage,current, frequency,resistance, capacitance,inductivity,power, power factor,energy
- AC/DC bridges
- voltage measuring transformers
- comparators
- potenciometers
- Watthourmeters

III/2 INSULATING MATERIALS LABORATORY

- Testing sets for measuring characteristics of industry materials = volume resistivity, surface resistivity, permittivity, loss factor
- Basic polarization measurements = High frequency, low frequency
- Partial discharge measuring set

III/3 MECHANICAL TESTING LABORATORY

- Mechanical testing of insulators =under load testing
- Mechanical testing set =for stranded and Bundled wires, boylers and tubes
- Qualitative testing on insulated and uninsulated conductors and their armatures
- Vibration testing equipment
- Creepage testing possibilities
- X ray testing set.

5. THE ORGANIZATIONAL STRUCTURE OF THE ELECTRIC ENERGY RESEARCH CENTRE

EERC - PLANNED MANPOWER CHART

| STAFF CATEGORIES | OFFICE OF DIRECTOR GENERAL | I ELECTRICAL ENGNG. DEPT | II SYSTEM ENGNG. DEPT | III TECHNICAL DEPT. | IV STUDIES INF. AND TRAINING DEPT. | V ADM. AND FINANTIAL DEPT. | TOTAL |
|---|---|---|---|---|---|---|---|
| 1 Director General | 1 | - | - | - | - | - | 1 |
| 2 Directors | - | 1 | 1 | 1 | 1 | 1 | 5 |
| 3 Head of Sections | - | 3 | 4* | 3 | 4** | 4*** | 18 |
| 4 Chief Engineers (Head of Laboratories) | - | 6 | 1 | 3 | - | - | 10 |
| 5 Engineers | - | 22 | 8 | 5 | 4 | 4 | 43 |
| 6 Chemists/Physicists/ Mathematicians | - | - | 6 | 6 | - | - | 12 |
| 7 Economists | - | - | - | - | 3 | 1 | 4 |
| 8 Other university graduates | - | - | - | - | 4 | 2 | 6 |
| 9 Techniciants | - | 35 | 5 | 15 | 5 | - | 60 |
| 10 Draftsmen | - | 1 | 1 | 1 | 2 | - | 5 |
| 11 Specialized staff(Translators etc) | 2 | - | - | - | 2 | 8 | 12 |
| 12 Clerks | 2 | 4 | 3 | 4 | 4 | 21 | 38 |
| 13 Foremen and Inspectors | - | 10 | 2 | 4 | 2 | 2 | 20 |
| 14 Workes (High skilled, skilled, Semi skilled) | - | 20 | 4 | 10 | 4 | 40 | 78 |
| 15 Security | - | - | - | - | - | 8 | 8 |
| TOTAL | 5 | 102 | 35 | 52 | 35 | 91 | 320 |

*) Head of 3 Sections and head of the Computer Centre

**) Head of 3 Sections and head of the Library

***) Head of 3 Sections and head of the Workshops

PERSONNEL BAR - CHART

| DEPARTMENTS | 1st year | 2nd year | 3rd year | 4th year | 5th year | TOTAL |
|---|---|---|---|---|---|---|
| OFFICE OF DIRECTOR GENERAL | 4 | - | 1 | - | - | 5 |
| I ELECTRICAL ENGINEERING | 11 | 18 | 18 | 31 | 24 | 102 |
| II SYSTEM ENGINEERING | 7 | 4 | 14 | 6 | 4 | 35 |
| III TECHNICAL | 8 | 10 | 18 | 8 | 8 | 52 |
| IV STUDIES INFORMATION AND TRAINING | 6 | 6 | 11 | 8 | 4 | 35 |
| V ADMINISTRATIVE AND FINANTIAL | 6 | 38 | 25 | 12 | 10 | 91 |
| TOTAL | 42 | 76 | 87 | 65 | 50 | 320 |

PERSONNEL QUALIFICATIONS BAR - CHART

| QUALIFICATIONS | 1st year | 2nd year | 3rd year | 4th year | 5th year | TOTAL |
|---|---|---|---|---|---|---|
| 1 ELECTRICAL ENGINEERS | 34 | 10 | 10 | 10 | 5 | 69 |
| 2 MECHANICAL ENGINEERS | - | 2 | 2 | - | 1 | 5 |
| 3 CHEMICAL ENGINEERS | - | - | 2 | - | 1 | 3 |
| ENGINEERS TOTAL | 34 | 12 | 14 | 10 | 7 | 77 |
| 4 CHEMISTS | - | 1 | 1 | - | 1 | 3 |
| 5 PHYSICISTS | - | 1 | 1 | 1 | - | 3 |
| 6 MATEMATICIANS | - | 2 | 2 | 1 | 1 | 6 |
| 7 ECONMISTS | - | 2 | 1 | 1 | - | 4 |
| 8 OTHER UNIVERSITY GRADUATES | - | 3 | 2 | 1 | - | 6 |
| 9 TECHNICIANS | - | 5 | 20 | 20 | 15 | 60 |
| 10 DRAFTSMEN | 1 | 1 | 1 | 1 | 1 | 5 |
| 11 SPECIALIZED STAFF(TRANLA - TORS ETC) | 1 | 4 | 4 | 2 | 1 | 12 |
| 12 CLERKS | 6 | 16 | 8 | 4 | 4 | 38 |
| 13 FOREMEN AND INSPECTORS | - | 4 | 8 | 6 | 2 | 20 |
| 14 HIGH SILLED WORKERS | - | 8 | 10 | 6 | 4 | 28 |
| 15 SKILLED WORKERS | - | 6 | 5 | 5 | 4 | 20 |
| 16 SEMI SKILLED WORKERS | - | 6 | 8 | 6 | 10 | 30 |
| 17 SECURITY | - | 5 | 2 | 1 | - | 8 |
| T O T A L | 42 | 76 | 87 | 65 | 50 | 320 |

FELLOWSHIPS AND STUDY - TOURS ABROAD FOR THE NATIONAL STAFF IN MAN/MONTH

| | 1st year | 2nd year | 3rd year | 4th year | 5th year | TOTAL |
|---|---|---|---|---|---|---|
| INDIVIDUAL FELLOWSHIPS | | | | | | |
| NATIONAL TEAM | 8* | - | - | - | - | 8 |
| ELECTRICAL ENGINEERING DEPARTMENT | 6 | 18 | 12 | 12 | - | 48 |
| SYSTEM ENGINEERING DEPARTMENT | 6 | 6 | 12 | 6 | 6 | 36 |
| TECHNICAL DEPARTMENT | 6 | 18 | 12 | 6 | - | 42 |
| STUDIES, INF. AND TRAINING DEPT. | 6 | 6 | 12 | 6 | 6 | 36 |
| ADMINSITRATIVE AND FINANTIAL DEPT. | 6 | 6 | 6 | - | - | 18 |
| TOTAL | 38 | 54 | 54 | 30 | 12 | 188 |
| STUDY - TOURS | | | | | | |
| DIRECTOR GENERAL | 3 | - | - | - | 3 | 6 |
| ELECTRICAL ENGINEERING DEPARTMENT | - | 3 | 3 | 3 | - | 9 |
| SYSTEM ENGINEERING DEPARTMENT | - | 3 | 3 | - | - | 6 |
| TECHNICAL DEPARTMENT | 3 | 3 | - | - | - | 6 |
| STUDIES, INF. AND TRAINING DEPT. | 3 | - | 3 | - | 3 | 9 |
| ADMINSITRATIVE AND FINANTIAL DEPT. | 3 | 3 | - | - | - | 6 |
| TOTAL | 12 | 12 | 9 | 3 | 6 | 42 |

* After signing of Project Documents for formulating the final requirements.

ANNEX II - WORKPLAN

PERSONNEL BAR - CHART OF UNIDO STAFF IN MAN/MONTH

| UNIDO STAFF | 1st year | 2nd year | 3rd year | 4th year | 5th year | TOTAL |
|---|---|---|---|---|---|---|
| CHIEF TECHNICAL ADVISER | 12 | 12 | 12 | 12 | 12 | 60 |
| UNIDO EXPERTS | | | | | | |
| 1 AUTOMATICS AND CONTROL | 2 | 2 | 6 | 12 | 12 | 34 |
| 2 HIGH VOLTAGE ENGINEERING | 2 | 6 | 12 | 12 | 12 | 44 |
| 3 HIGH POWER ENGINEERING | 2 | 6 | 12 | 12 | 6 | 38 |
| 4 SYSTEM ENGINEERING | 1 | 2 | 12 | 6 | 2 | 23 |
| 5 PROTECTIONS | 2 | 2 | 6 | 6 | 2 | 18 |
| 6 COMPUTER ENGINEERING | 3 | 12 | 12 | 12 | 12 | 51 |
| 7 MEASUREMENT,CALIBRATION AND QUALITY CONTROL | 2 | 6 | 12 | 6 | 2 | 28 |
| 8 INSULATING MATERIALS | 2 | 6 | 12 | 6 | 2 | 28 |
| 9 MECHANICAL ENGINEERING | 2 | 6 | 6 | 6 | 12 | 32 |
| 10 TECHNICAL LIBRARY | 2 | 12 | 6 | 2 | 2 | 24 |
| 11 EDUCATION AND TRAINING IN POWER INDUSTRY | 2 | 2 | 2 | 2 | 2 | 10 |
| UNIDO SPECIAL CONSULTANTS* | 6 | 10 | 10 | 10 | 8 | 44 |
| T O T A L | 40 | 84 | 120 | 104 | 86 | 434 |

* Consultants determined by the Cheif Technical Adviser in agreement with the Director General of EERC according to special requirements.

(a) PREACTIVITIES

- Preparatory assistance of UNDP/UNIDO to the Iraqi National Team composed of SOE.
- Preparation of Project Documents
- Signing and approving of Project Documents
- Nomination of National Project Director who is the Director General of EERC (Iraqi Government)
- Nomination of Chief Technical Adviser(UNDP/UNIDO)
- Organization of study-tours for the members of the National Team for formulating the final requirements

(b) ACTIVITIES

1ST YEAR

- Determination of detailed Project Operation (CTA and DG)
- Recruiting KEY National Staff (SOE)
- Set up 5 Departments
- Training of key National Staff.
- Preparing of programmes for fellowships and study-tours.
- Selection and recruitment of highly specialized short term Experts and international Consultants(CTA).
- Architectural design of buildings.
- Preparation of specifications and requisitions for laboratories to be purchased indigenously and abroad.
- Placement of orders for equipments.

2ND YEAR

- Completion of construction of the buildings.
- Set up the Workshops
- Set up the Technical Library .
- Recruiting Technical Staff.
- Training Technical Staff.
- Implementation of fellowships and study-tours.

3RD YEAR

- Installation and testing equipments.
- Set up High Voltage Indoor Laboratory.
- Set up Calibration and Testing Laboratory.
- Set up Insulating Materials Laboratory.
- Set up Computer Centre.
- Set up Secondary Equipment Testing Laboratory.
- Implementation of fellowships and study-tours
- Preparation of Training Syllabi

4TH YEAR

- Installation and testing equipments
- Operating laboratories.
- Set up High Voltage Open Space Laboratory.
- Set up High Power Laboratory.
- Set up Transient Network Analyser Laboratory.
- Set up Mobile Laboratories .
- Organizing training seminars for Technical Staff.

5TH YEAR

- Installation and testing equipments
- Operating laboratories.
- Set up Mechanical Testing Laboratory.
- Set up Synthetic Testing Laboratory.
- Operating EERC.

PROJECT BUDGET COVERING GOVERNMENT COUNTERPART CONTRIBUTION. (1) (IN IRAQI DINARS)

COUNTRY: IRAQ

PROJECT NUMBER:

PROJECT TITLE: ASSISTANCE TO THE ESTABLISHMENT OF THE IRAQI ELECTRIC ENERGY RESEARCH CENTRE,BAGHDAD

| | TOTAL | | 1st YEAR | | 2nd YEAR | | 3rd YEAR | | 4th YEAR | | 5th YEAR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | ID | m/m | ID | m/m | ID | m/m | ID | m/m | ID | m/m | ID |
| 1 Project Personnel National Staff | | | | | | | | | | | | |
| 1.1. Director General/National Project Director(1) | 60 | 27.000 | 12 | 5.400 | 12 | 5.400 | 12 | 5.400 | 12 | 5.400 | 12 | 5.400 |
| 1.2. Directors (5) | 300 | 120.000 | 60 | 24.000 | 60 | 24.000 | 60 | 24.000 | 60 | 24.000 | 60 | 24.000 |
| 1.3. Head of sections(18) | 1080 | 432.000 | 216 | 86.400 | 216 | 86.400 | 216 | 86.400 | 216 | 86.400 | 216 | 86.400 |
| 1.4. Chief engineers (10) (Head of laboratories) | 600 | 240.000 | 120 | 48.000 | 120 | 48.000 | 120 | 48.000 | 120 | 48.000 | 120 | 48.000 |
| 1.5 Engineers (43) | 1404 | 421.200 | - | - | 144 | 43.200 | 312 | 93.600 | 432 | 129.600 | 516 | 154.800 |
| 1.6 Chemists/Physicists/Mathematicians (12) | 408 | 61.200 | - | - | 48 | 7.200 | 96 | 14.400 | 120 | 18.000 | 144 | 21.600 |
| 1.7. Economists (4) | 156 | 23.400 | - | - | 24 | 3.600 | 36 | 5.400 | 48 | 7.200 | 48 | 7.200 |
| 1.8. Other university graduates(6) | 240 | 36.000 | - | - | 36 | 5.400 | 60 | 9.000 | 72 | 10.800 | 72 | 10.800 |

PROJECT BUDGET COVERING GOVERNMENT COUNTERPART CONTRIBUTION. (2) (IN IRAQI DINARS)

| | TOTAL | | 1st YEAR | | 2nd YEAR | | 3rd YEAR | | 4th YEAR | | 5th YEAR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | ID | m/m | ID | m/m | ID | m/m | ID | m/m | ID | m/m | ID |
| 1.9 Technicians (60) | 1620 | 234.000 | - | - | 60 | 9.000 | 300 | 45.000 | 540 | 81.000 | 720 | 108.000 |
| 1.10. Draftsmen (5) | 180 | 21.600 | 12 | 1.440 | 24 | 2.880 | 36 | 4.320 | 48 | 5.760 | 60 | 7.200 |
| 1.11. Specialized Staff (12) (translators ETC.) | 456 | 68.400 | 12 | 1.800 | 60 | 9.000 | 108 | 16.200 | 132 | 19.800 | 144 | 21.600 |
| 1.12. Clerks (38) | 1560 | 187.200 | 72 | 8.640 | 264 | 31.680 | 360 | 43.200 | 408 | 48.960 | 456 | 54.720 |
| 1.13. Foremen and Inspectors (20) | 648 | 97.200 | - | - | 48 | 7.200 | 144 | 21.600 | 216 | 32.400 | 240 | 36.000 |
| 1.14 Workers (78) | 2412 | 289.440 | - | - | 240 | 28.800 | 516 | 61.920 | 720 | 86.400 | 936 | 112.320 |
| Security (8) | 336 | 40.320 | - | - | 60 | 7.200 | 84 | 10.080 | 96 | 11.520 | 96 | 11.520 |
| Component Total | 11460 | 2.307.960 | 504 | 175.680 | 1416 | 318.960 | 2460 | 488.520 | 3240 | 615.240 | 3840 | 709.560 |
| 2. Travel allowance component total | - | 56.000 | - | 3.000 | - | 8.000 | - | 15.000 | - | 15.000 | - | 15.000 |
| 3. Training component total | - | 88.000 | - | 3.000 | - | 20.000 | - | 25.000 | - | 25.000 | - | 15.000 |
| 4. Physical facilities and equipments | | | | | | | | | | | | |
| 4.1. Territory | - | 1.200.000 | - | 1.200.000 | - | - | - | - | - | - | - | - |

PROJECT BUDGET COVERING GOVERNMENT COUNTERPART CONTRIBUTION. (3) (IN IRAQI D NARS)

| | TOTAL | | 1st YEAR | | 2nd YEAR | | 3rd YEAR | | 4th YEAR | | 5th YEAR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | ID | m/m | ID | m/m | ID | m/m | ID | m/m | ID | m/m | ID |
| 4.2 Buildings* | - | 3.826.000 | - | 1.160.000 | - | 1.866.000 | - | 700.000 | - | 50.000 | - | 50.000 |
| 4.3 Laboratory and workshop equipments ** | - | 3.700.000 | - | 700.000 | - | 1.800.000 | - | 800.000 | - | 300.000 | - | 100.000 |
| 4.4 Office Equipments | - | 150.000 | - | 30.000 | - | 30.000 | - | 30.000 | - | 30.000 | - | 30.000 |
| 4.5 Transport and communication equipments | - | 120.000 | - | 30.000 | - | 30.000 | - | 30.000 | - | 20.000 | - | 10.000 |
| 4.6 Inventory | - | 64.000 | - | 8.000 | - | 12.000 | - | 20.000 | - | 20.000 | - | 4.000 |
| 4.7 Technical publication | - | 100.000 | - | 2..000 | - | 20.000 | - | 20.000 | - | 20.000 | - | 20.000 |
| Component Total | - | 9.160.000 | - | 3.148.000 | - | 3.758.000 | - | 1.600.000 | - | 440.000 | - | 214.000 |
| 5 Miscellaneous | | | | | | | | | | | | |
| Component Total | - | 750.000 | - | 150.000 | - | 150.000 | - | 150.000 | - | 150.000 | - | 150.000 |
| Total Government contribution | 11460 | 12.362.000 | 504 | 3.480.000 | 1416 | 4.255.000 | 2460 | 2.278.000 | 3240 | 1.245.000 | 40 | 1.104.000 |

* estimated value of $1M^2$ office = ID 500

$1M^2$ laboratory = ID 500, and

$1M^2$ workshop = ID 120.

** Estimated costs based upon present prices

PROJECT BUDGET COVERING UNDP CONTRIBUTION (1) (IN US DOLLARS)

COUNTRY: IRAQ

PROJECT NUMBER: IRQ/87

PROJECT TITLE: ASSISTANCE TO THE ESTABLISHMENT OF THE IRAQI ELECTRIC ENERGY RESEARCH CENTRE, BAGHDAD

| | TOTAL | | 1st YEAR | | 2nd YEAR | | 3rd YEAR | | 4th YEAR | | 5th YEAR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | US $ | m/m | US $ | m/m | US $ | m/m | US $ | m/m | US $ | m/m | US $ |
| I Project Personnel | | | | | | | | | | | | |
| 1.1. International Staff | 434 | 4.340000 | 40 | 400.000 | 84 | 840.000 | 120 | 1.200000 | 104 | 1.040000 | 86 | 860.000 |
| 1.2. Support Personnel | - | 95.000 | - | 15.000 | - | 20.000 | - | 20.000 | - | 20.000 | - | 20.000 |
| 1.3 Travel costs | - | 125.000 | - | 25.000 | - | 25.000 | - | 25.000 | - | 25.000 | - | 25.000 |
| 1.4 Others | - | 110.000 | - | 22.000 | - | 24.000 | - | 24.000 | - | 20.000 | - | 20.000 |
| Component Total | 434 | 4.670.000 | 40 | 462.000 | 84 | 909.000 | 120 | 1.269.000 | 104 | 1.105.000 | 86 | 925.000 |
| 2 Training | | | | | | | | | | | | |
| 2.1 Individual Fellowships | 188 | 752000 | 38 | 152.000 | 54 | 216.000 | 54 | 216.000 | 30 | 120.000 | 12 | 48.000 |
| 2.2 Study - Tours | 42 | 252.000 | 12 | 72.000 | 12 | 72.000 | 9 | 54.000 | 3 | 18.000 | 6 | 36.000 |
| Component Total | 230 | 1.004.000 | 50 | 224.000 | 66 | 288.000 | 63 | 270.000 | 33 | 138.000 | 18 | 84.000 |

Remarks: Calculated proforma costs for International Staff is 1m/m = US $ 10.000,

individual fellowships for National Staff is 1m/m = US $ 4.000,

study - tours for National Staff is 1m/m = US $ 6.000.

PROJECT BUDGET COVERING UNDP CONTRIBUTION. (2) (IN US DOLLARS)

| | TOTAL | | 1st YEAR | | 2nd YEAR | | 3rd YEAR | | 4th YEAR | | 5th YEAR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | US $ | m/m | US $ | m/m | US $ | m/m | US $ | m/m | US $ | m/m | US $ |
| 3. Equipment Component Total | - | 880.000 | - | 210.000 | - | 230.000 | - | 230.000 | - | 110.000 | - | 100.000 |
| 4. Miscellaneous Component Total | - | 170.000 | - | 35.000 | - | 35.000 | - | 35.000 | - | 35.000 | - | 30.000 |
| TOTAL | 664 | 6.724.000 | 90 | 931.000 | 150 | 1.462.000 | 183 | 1.804.000 | 137 | 1.388.000 | 104 | 1.139.000 |

PROJECT BUDGET

COUNTRY: IRAQ

PROJECT NUMBER:

PROJECT TITLE: ASSISTANCE TO THE ESTABLISHMENT OF THE IRAQI ELECTRIC ENERGY RESEARCH CENTRE, BAGHDAD

| | TOTAL | | 1st YEAR | | 2nd YEAR | | 3rd YEAR | | 4th YEAR | | 5th YEAR | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | m/m | US $ /ID | m/m | US $/ID | m/m | US $/ID | m/m | US $/ID | m/m | US $/ID | m/m | US $/ID |
| Total UN System Contribution Proposed | 664 | 6.724.000 $ | 90 | 931.000 $ | 150 | 1.462.000 $ | 183 | 1.804.000 $ | 137 | 1.388.000 $ | 104 | 1.139.000 $ |
| Total Government Contribution Proposed | 11460 | 12.362.000 ID | 504 | 3.480.000 ID | 1416 | 4.255.000 ID | 2460 | 2.278.000 ID | 3240 | 1,245.000 ID | 3840 | 1.104.000 ID |