

## **STANDARD SUMMARY PROJECT FICHE**

### **1. Basic Information**

<b>1.1 Désirée Number:</b>	RO-0005.01
<b>1.2 Title:</b>	<b>ENERGY SECTOR LIBERALISATION</b>
<b>1.3 Sector :</b>	Infrastructure (IN)
<b>1.4 Location:</b>	Romania

### **2. Objectives**

#### **2.1 Wider Objective(s)**

The proposed programme is an integral whole – the institution building and the investment projects are part of the total package of measures proposed to bring about real reform in the energy sector, and co-financed by other IFIs. Three main parts can be identified: IB for the Gas sector, IB for the electricity sector and investment in the electricity sector. The proposed investment project for the electricity transmission sector is critical to the introduction of a power market, and hence a reformed electricity sector which operates in conformity with the single electricity market directive.

The fundamental objective of this programme of inter-related institution building and investment is to bring about a restructuring and reform of the electricity and gas sectors in Romania with the introduction of market mechanisms, private capital, and market discipline.

#### **2.2 Immediate Objectives**

- Consolidation and strengthening of the electricity and heat regulatory authority, and the gas regulatory authority to enable the regulators to bring about and enforce the real restructuring and introduction of market mechanisms.
- Following the government decision to privatise part of the energy distribution companies, the completed privatisation of 4/5 regional electricity companies and 2 regional gas distribution companies, in order to create a critical mass of private ownership in the energy distribution sector; and ensure that financial discipline is introduced between consumers and distributors.
- To assist in the creation of an independent national power transmission company which can act as the common carrier (neutral system operator), in order to enable competition to be introduced into power supply.
- To establish a commercial market operator and to create a working wholesale electricity market.
- To achieve progress in meeting the technical conditions for Romania to join the interconnected European electricity network.

#### **2.3 Accession Partnership and NPAA priority**

The AP 1999 medium term priority is 'prepare for the internal energy market'. Therefore, it is necessary to develop the regulatory institutions required for a competitive market based environment. In addition it is necessary to create a market-based environment, and to make the necessary investments in the electricity transmission system, to allow compliance with the single electricity market.

### **3. Description**

#### **3.1 Background and justification**

The reform of the energy sector is a key element in the macro economic reform of Romania. Problems include an ageing infrastructure with over-capacity in generation, and a transmission system and distribution system that require substantial modernisation. The overall system is inefficient and over-manned, and burdened by the need to run generating plant for heat generation and for domestic coal consumption, which are sub-optimal from the economic point of view. The main enabling legislation for this reform is a new Electricity and Heat Law that Government passed as an Emergency Ordinance in December 1998. This law covers the basic principles for regulating the power market, including financially and economically sound pricing, fair means for entering and leaving the market, and the creation of the regulatory entity.

Some important steps have already been taken towards reforming the electricity sector. The first stage in the sequence of reforms was government's approval on 9 June 1998 of an order to restructure the vertically integrated state utility into the following components:

- the National Power Company - CONEL – as a holding company with three subsidiaries: Termoelectrica - the generating company for thermal power plants, Hidroelectric - the generating company for hydro-electricity, Electrica – the single distribution company with 42 country based distribution branches. Transmission and dispatch is a function under the direct control of CONEL.
- the National Nuclear Company for the Cernavoda nuclear power complex, and a national regime to manufacture heavy water for Cernavoda.

The second stage of the reform, is based on Government Decision 138 (28/02/00) 'Concerning the restructuring programme in the sector of electricity and heat'. This will consist of the end of the holding company structure, with the separation of generation, transmission and distribution into legally autonomous companies, to be followed by the subdivision of generation and distribution into a number of separate companies. CONEL will be transformed into the National Power Grid Company (NPGC) which will have the responsibility for the operation of the transmission system, and which will also fulfil the commercial operator role.

Regulatory institutions are being developed in parallel: a National Regulatory Authority (ANRE) for electricity and heat (created through an emergency ordinance) started work in March 1999. PHARE is currently providing considerable technical and financial assistance for the establishment of the agency and for the development of secondary legislation for the sector relating

to tariffs and pricing, and licensing and authorisations. However, utility regulation is a highly complex and specialised field, which requires some additional assistance.

Concerning Gas the Government recently passed (30 January, 2000) two ordinances. The first established the gas regulatory authority (which is modelled on the electricity and heat regulatory authority) and the second was the Gas Law, which is primary legislation, which set out the basic principles for market opening, the details of which must be developed through secondary legislation/ regulation to be issued by the Regulatory Authority. However, as in the case of electricity, for the creation of a sustainable market in gas, which complies with the requirements of the gas single market directive, further assistance is required to complete the task of building a strong and competent (and independent) regulatory authority which can complete and then oversee the transition to a full market structure in the gas market in Romania.

### 3.2 Linked activities

#### 3.2.1 Previous projects

Phare has been providing policy advice for several years, and co-operating with USAID, the World Bank, and the EBRD in developing the conditions for IFI investment in the energy sector.

Project	Status
<b>Phare 1993 Programme</b>	
Study of the economic merit of completing unfinished hydro and thermal electric capacity	Completed
Pilot projects and sectoral strategies for energy efficiency	Completed
Establishment of a least cost power development strategy with a merit order for investment to maintain existing capacity and build new capacity. This project also included a study of the pricing and tariff system for the supply of both electricity and heat.	Completed
Energy prices and tariffs for coal. This study formulated a pricing system for coal based on the economic cost to Romania of supplying each form of lignite and hard coal.	Completed
<b>Phare 1995 Programme</b>	
Start up assistance for the National Energy Regulatory Authority (ANRE).	Completed 12/99
Preparation of a pro-forma financial statements and forecasts for NPGC as a transmission company	Completed 10/99
<b>Phare 1998 Programme</b>	
Strategy for restructuring and privatisation in the electricity distribution sector	Contracting
Assistance in the development of secondary legislation for the regulation of electricity and heat markets	Contracting
Assistance for the establishment of a gas regulatory authority	Preparation
<b>Phare (Bangkok facility) financed through EBRD</b>	
Preparation of a business plan for the National Electricity Company (organised as a transport-dispatch company)	Underway (started Jan 00)

### **3.2.2 Planned IFI assistance/ projects**

#### Electricity Transmission project

The proposed investment in the electricity transmission project is a joint project to be funded by the EBRD, EIB, Phare, and by NPGC. The EBRD loan of 51.4 M. EUR and the EIB loan of 81.3 M. EUR are currently in the final phase of negotiation. Both have passed initial review by the respective banks.

The transmission loan project is supported by the work being undertaken by consultants (Fichtner) under EBRD administered Phare Bangkok facility funds to prepare a business plan for NPGC as a transmission company (system operator and commercial market operator). This TA project includes the preparation of the technical specifications for metering and for the commercial market operator (IT system).

#### Electricity distribution

The EBRD has proposed to participate in the electricity distribution privatisation through the 'pre-privatisation equity warehouse' scheme. There are several approaches, which could be taken for equity warehousing, which involves the EBRD in investing equity capital (US\$ 20 m.) in the first of the two distribution companies to be privatised under the Phare 1998 funded pilot privatisation project. For the remaining electricity distribution companies the EBRD has committed to the Government a further pre-privatisation equity investment of up to US\$80 m.

### **3.3 Results**

The technical assistance for the Electricity Regulatory Authority, and the Gas Regulatory Authority (sub-project 1 and 2) should produce:

- norms and regulations governing the operation of a market based electricity system, with both bilateral contracts and a wholesale 'spot' market
- the creation of a database (as required in the in the Electricity and Heat Law, and in the Gas Law) to enable the regulator to monitor the performance of the sector, and the operation of the market.

The technical assistance for the distribution privatisation (sub-project 3 and 4) should result into:

- the completed privatisation of further 4/5 regional electricity distribution companies
- the completed privatisation of 2 gas distribution companies

The investment (sub-project 6) should result into:

- the functioning of an independent national power grid, operating in an unbundled power system, which is technically capable of operating the

transmission system safely and securely within a market based background

- the creation and working of a commercial market operator

### 3.4 Activities

#### **Sub-project 1. Consolidation of the Electricity Regulatory Authority**

The National Authority for Energy Regulation (ANRE) was established through an emergency ordinance in October 1998, and started operations at the beginning of March 1999. After 10 months of operations, which have been assisted by the 1995 Phare programme, it is clear that very encouraging progress has already been made towards establishing a professional electricity and heat sector regulator. ANRE have already issued 30 separate regulations, and the key regulations of the Grid Code and the Distribution Code (drafted by CONEL) have already been issued, at least in interim, draft form. Further, progress has been made in the establishment of the commercial market operator, and in the establishment of framework contracts to govern commercial relations between generators and distributors.

The Phare 1998 project to provide TA to ANRE is providing training to the Authority, and specialised technical assistance in two areas of key importance in utility regulation – in the development of licenses and authorisations and in the development of methodologies for pricing and tariffs.

One further project of specialised technical assistance is now considered necessary in relation to the development of the commercial market (required to meet the terms of the electricity single market directive, which requires market opening). The Electricity Law (Ordinance 63/98) requires that ANRE should be responsible for overseeing the operation of electricity and heat markets. Specifically, the Ordinance 29/98 establishing ANRE, requires that ANRE should set up a database “required in its activity and for supplying information to other authorities in the development of the strategy of the electricity and heat sector”. This means that ANRE must closely follow the operation of the electricity and heat markets by gathering information on the markets, and by closely analysing the development of prices and volumes of electricity traded on the market (which includes both electricity sold through bilateral contracts and electricity sold on the spot market).

*Activity:* Technical assistance in the drafting of the detailed norms and regulations for the electricity market, and the provision of hardware and software for the system and market monitoring database. This will require input from specialised consultants with experience in electricity markets and electricity regulation in a market based context. Budget 0.9 M EUR.

#### **Sub-project 2. Technical Assistance for the Gas Regulatory Authority**

The enabling legislation to set up the Gas Regulatory Authority (ANRGN) was passed at the end of January as a Government Ordinance, and the Authority is currently in the process of being set up.

The support to be provided under the Phare 1998 programme (whose implementation has been contingent on the establishment of the Authority) will provide initial logistical and technical support to the Authority to help them to establish the organisation, and also in the key areas of secondary legislation relating to licenses and authorisations, and pricing and tariffs. As with the electricity and heat regulator, based on the experience in the Member States and other candidate countries in establishing utility regulators, these are organisations which require very high levels of technical expertise if they are to successfully regulate large energy utilities. In addition the concept of a strong independent non-political regulatory agency to create and enforce market operation is new to Romania. For these reasons further institutional strengthening through a project of technical assistance is required to consolidate and complete the work funded under the Phare 1998 programme.

It is proposed that the further technical assistance to be given under this programme would concentrate on building the capacity of the regulatory authority to create and then enforce market opening in the gas sector in Romania. ANRGN have the authority to set the basic principles of framework contracts concerning the sale, purchase and supply of gas to users, and also to set the “requirements, criteria and procedures for the direct-contracting of gas to end-users” (i.e. market opening). As with the electricity sector, in order to enforce and maintain a market opening the regulator must draft and then enforce the necessary regulations.

*Activity:* Technical assistance in the drafting of the detailed technical norms and regulations. Also the provision of hardware and software for the monitoring of the gas market and gas system. This will require TA from specialised consultants with experience in gas markets and regulation of market based gas systems. Budget 1.1 M EUR.

### **Sub-project 3. Further electricity distribution privatisation**

The pilot project to privatise the first two electricity distribution utilities is being funded under the Phare 1998 Programme. One (and possibly both) of these could also be the subject of a pre-privatisation equity investment from the EBRD, which should assist in the marketing and sale of the companies. However, the experience in developing this project, and the deterioration in the financial health of CONEL in recent months, suggests that there are important justifications for further support for privatisation of distribution utilities.

The financial situation of the electricity industry has deteriorated further as collections continue to decline (largely from state owned companies to the state owned utility), and fuel costs of generation have increased. Privatisation is not by itself a panacea, but it is clear that the market discipline which strategic investors in an electricity distribution company would impose must improve collections. The Government has decided to create 14 regional distribution. For this reason it is important that a critical mass of private distributors is quickly created, to avoid the situation where 12 distributors are state owned (with all of the present problems caused by lack of funds, lack of investment, and lack of market discipline) and 2 distributors are private.

4/5 regional electricity distribution companies will be selected from the 12 companies remaining (2 being privatised under the RO9805.01 Programme) for privatisation. These companies will be selected based on the information provided by the sector analysis (economic, financial and technical) which will be performed by the consultants recruited under the RO9805.01-03 project to privatise the electricity distribution companies of Constanta and Timisoara. The criteria for selection, and the selection itself, will be agreed by the European Commission and the Ministry of Industry and Trade.

The privatisation advisers funded under this sub-project will have a mandate for privatisation of these electricity distribution companies. The Phare funds will cover the retainer fee of the advisers, while a separate success fee will be paid by the Ministry of Industry and Trade from the proceeds of the privatisation transaction. Before the start of the project the Minister of Industry and Trade will establish a privatisation committee which will be empowered to take all necessary decisions relating to the privatisation.

*Activity:* Technical assistance from privatisation advisers (requiring input from investment bankers, lawyers, financial advisers, and engineers) to prepare the 4/5 electricity distribution companies for privatisation, and to complete the privatisation transaction. This will include advising the Ministry of Industry and Trade on the negotiation and closing of the sale. Budget 4 M EUR.

#### **Sub-project 4. Gas distribution privatisation**

Reform and restructuring of the gas industry is following a similar path to that already being followed in electricity. The vertically integrated ROMGAZ is being split into three legally and commercially separate parts – production, transmission, and distribution. At present there are only 2 gas distribution companies (North and South), but these two companies will be further broken down into a number of regional distribution companies. The rationale of the GOR to privatise these gas distribution companies is clear. Privatisation will increase market discipline, reduce commercial and technical losses, and introduce private capital for necessary refurbishment and distribution expansion. The legal separation of Romgaz is anticipated to occur in stages starting at the beginning of March 2000. The creation of separate regional gas distribution companies is planned for the first quarter of 2001.

The purpose of this project is to follow the model used in the privatisation of electricity distribution funded under the Phare 1998 Programme, and to prepare for, and privatise two gas distribution companies. The two companies to be selected for privatisation will be representative of the sector as a whole. These companies will be selected on the basis of economic, financial and technical analysis of the gas distribution sector which will be performed by Romgaz and the Ministry of Industry and Trade in order to take the decision on the number and geographical area of the regional gas distribution companies to be created. The criteria for selection of the two companies, and the selection itself, will be agreed by the European Commission and the Ministry of Industry and Trade.

The privatisation advisers funded under this sub-project will have a mandate for privatisation of the two gas distribution companies. The Phare funds will cover the retainer fee of the advisers, while a separate success fee will be paid by the Ministry of Industry and Trade from the proceeds of the privatisation transaction. Before the start of the project the Minister of Industry and Trade will establish a privatisation committee which will be empowered to take all necessary decisions relating to the privatisation.

*Activity :* Technical assistance from privatisation advisers (requiring input from investment bankers, lawyers, financial advisers, and engineers) to prepare the 2 gas distribution companies for privatisation, and to complete the privatisation transaction. This will include advising the Ministry of Industry and Trade on the negotiation and closing of the sale. Budget 2 M EUR.

### **Sub-project 5. Assistance in programme implementation**

The proposed programme is a complex, and interrelated programme which involves close collaboration with the IFIs (most especially the EBRD and EIB) and close monitoring to ensure that the strong conditionalities of the programme are met. For this reason the implementing authority, the Ministry of Industry and Trade will require technical assistance to implement and monitor the programme.

*Activity:* Technical assistance to the Ministry of Industry and Trade to prepare and implement the institution building and investment sub-projects within this programme. This will require specialised TA from consultants with knowledge of the restructuring of the electricity and gas markets, and also independent consulting engineers to provide monitoring and control functions for the investment sub-projects. Budget 0.5 M EUR.

### **Sub-project 6. Transmission grid (Investment)**

The national electricity supply system in Romania is currently being restructured, with the objective of creating an industry made up of legally and financially independent generation, transmission, and distribution companies. The aims of this restructuring are to overcome the problems of non-payment and lack of funds for investment which have dogged the industry. The restructuring should attract private sector finance for investment, hence reducing the Government's obligation to invest in the sector. A further aim is to prepare Romania for membership in the UCTE (the interconnected European power-exchange network) so that Romania can participate in regional electricity trading and offer transmission services to transmit power for neighbouring electricity supply systems.

The importance of transmission in this restructuring is crucial to the success of reform for the whole sector. Without a neutral transmission system operator there can be no operation of a real power market, and there can be no privatisation (hence no introduction of private sector capital) in either distribution or generation. To create this separate transmission company, and the related electricity market, requires the creation of a commercial operator, who will operate the market trading and commercial relations between generators and consumers, and who will also operate the market settlement



system. It also requires the strengthening of the system operator, in order to allow a market to operate.

#### Component 6.1 Improved Communication Links

In order to monitor, supervise, and control the transmission system the national dispatch centre must have full ‘visibility’ of all substations and power plants. To do this they need adequate communications links. The central hardware and software in the national dispatch centre can only be fully utilised with suitable telecommunication links which provide the national dispatch centre with the links to the substations and to the power plants, allowing remote monitoring and control, and to the commercial operator. The present communications links are not adequate for such remote operation or for the metering frequency needed for market operation. This is not just a question of a reliability improvement (though this would be a result of improved communications). It is a part of the investment need to create the ability to operate a power market. Thus the improvements to the EMS and SCADA and the improved communications links (and other improvements to be funded by EBRD and EIB) are interlinked. These are both necessary to allow a market based transmission system to work.

The telecommunications project consists of two main elements:

- (a) A ‘backbone’ system based on ‘optical ground wires’ (OPGW - fibre optics together with conducting ground wire cables) on the 400 kV high voltage transmission system, which is planned to connect 43 of the 69 ‘nodes’ – substations, power plants, and dispatch centres, with termination equipment at each end of each length of OPGW (i.e. in each substation and power plant)
- (b) Off-grid microwave and radio links for the remaining 26 nodes which are not directly connected to the OPGW backbone based on the 400 kV high voltage grid. There are many branches off the main high voltage grid to substations and power plants which would be extremely expensive to use fibre optic OPGW for. For these ‘spur’ locations microwave and radio links are necessary. Microwave links are used where the site to be connected is more isolated, while ‘wireless local loop’ radio (TDMA) links are used where there are a number of sites to be connected within the same area.

The EBRD is proposing to finance the backbone OPGW system and termination equipment (21.1 M EUR), while the off-grid microwave and radio links are part of the Phare funded project (8.8 M EUR).

#### Component 6.2 EMS and SCADA

As the System Operator, NPGC will have the following principal responsibilities:

- Forecasting aggregate system demand
- Operational management of the transmission system
- Scheduling and dispatch of generation to meet the expected system demand

- Maintenance of system frequency, voltage, and interchanges with neighbouring countries

The system operator uses Supervisory Control and Data Acquisition (SCADA) systems to monitor and supervise the power network. A modern SCADA system has been installed, and a limited range of Energy Management System (EMS) software is being installed. However, the system needs further improvement to operate within a market based environment. In a power market which is being unbundled, and competition is being introduced, the role of economic dispatch changes considerably. Instead of units being dispatched on the basis of costs (or other criteria, such as the use of domestic coal) they will now be dispatched on the basis of prices which are determined by the operation of a wholesale market.

When the market is in operation, it is necessary for the System Operator to demonstrate that it has run the system in a transparent manner. In order to operate the system taking into account the market based merit order and also transmission constraints, and other technical constraints, the NPGC require further improvement of the EMS software and SCADA systems (6.1 M EUR).

### Component 6.3 Commercial Operator

The Electricity and Heat Law (Emergency ordinance 63/98) required that a commercial operator should be established, and ANRE is charged with issuing the regulations necessary to set up this market, and to oversee its operation. The system operator has recently established a unit which it is planned will function as the commercial operator. However, in order to establish a commercial operator investment in systems and hardware and software are required. The commercial operator is responsible for the creation and operation of a competitive and economically efficient wholesale electricity market. To do this, the commercial operator will require systems, which address the following:

- Market participants registration
- Bids and offers
- Scheduling and dispatch
- Compliance monitoring
- Settlement
- Billing
- Market funds administration

In addition systems will be required to address ancillary services operation and settlement, transmission use of system billing, meter registration, metering, and data collection.

The objective of this investment component is to procure, commission, and operate the necessary systems which will allow the commercial market operator to function, and hence a power market to be created in Romania (3 M EUR). This is necessary both to meet the requirements of the Romanian Electricity Law, but also to meet the requirements of the

Single Electricity Market Directive, which requires phased market opening of the electricity market.

#### Component 6.4. GIS/ MIS

Geographical Information Systems (GIS) and Management Information Systems (MIS) are a related investment necessary for the operation of the transmission system. The GIS is essentially a pictorial geographical database of the transmission system, which improves the ability of the system operator to manage assets, and to schedule operations and maintenance. The MIS produces the management reports - financial reports, operational reports, linked to the information in the GIS database.

This system is required as part of the overall programme of investments to create an efficient system operator and commercial market operator. The budget is 2.5 M EUR.

#### **4. Institutional Framework**

*Consolidation of the Electricity Regulatory Authority and Technical Assistance for the Gas Regulatory Authority (sub-projects 1 and 2)*

The three institutions involved in this sub-project are:

- (i) the Ministry of Industry and Trade, which is responsible for overseeing the restructuring of the energy sector, and which exercises the right of owner over the electricity and gas industry,
- (ii) the electricity and heat regulatory authority (ANRE) which will be one direct beneficiary of this institution building, and the counterpart of the consultants who will provide the assistance, (iii) the Gas Regulatory Authority, which is now in the process of establishment, will be the other direct beneficiary and counterpart of this TA.

*Further electricity and gas distribution privatisation (sub-projects 3 and 4)*

The Ministry of Industry and Trade is the owner of the electricity industry and of the gas industry.

The companies to be privatised will be the direct counterparts of the advisers who will under this project, and will establish counterpart teams (in each company to be privatised) to work with the advisers.

*Assistance in programme implementation (sub-project 5)*

The Ministry of Industry and Trade will be the direct beneficiary of the technical assistance for the implementation of sub-projects 1-4, and thus will be the counterpart for the consultants who will provide this technical assistance.

*Transmission Grid (sub-project 6)*

The beneficiary of this investment sub-project is the National PowerGrid Company(NPGC). A PIU to be established within NPGC will be responsible (on

behalf of the GOR) for ensuring that the investments made in this project are in conformity with designs, and to a quality standard acceptable to the European Commission, and for controlling the quality of goods and equipment procured and installed.

This sub-project will be implemented by NPGC who will provide the necessary technical input to ensure correct implementation, through a PIU. In addition NPGC will be advised by independent consulting engineers. These engineers will act as independent, impartial contracts supervisor, to control the implementation of Phare financed investment components, to ensure respect for design and technical specifications and endorse invoices for payment on works and supplies contracts. The supervisors should conduct regular on-site inspections of work-in progress, identify any problems in implementation, and advise on any remedial action to be taken by contractors.

The Engineer will be contracted by the CFCU under sub-project 5 of the institution building component (technical assistance in implementation) and will work closely with the PIU in NPGC.

In order to ensure coherence between the two parts of the programme (institution building and investment), and in order to monitor compliance with conditionalities, the Ministry of Industry and Trade will retain a strong involvement in monitoring the implementation of the Investment programme, and in ensuring that conditionalities are met.

Upon completion of the project the investments will become assets of the NPGC, which is planned to remain in state ownership, as the system operator and commercial market operator.

## 5. Detailed Budget

	<b>Phare Support</b>					
	<b>Investment Support M EUR</b>	<b>Institution Building M EUR</b>	<b>Total Phare (=I+IB) M EUR</b>	<b>National Co-financing M EUR</b>	<b>IFI M EUR</b>	<b>TOTAL M EUR</b>
Institution building						
1. Electricity and Heat Regulator		0.90	0.90			0.90
2. Gas regulator		1.10	1.10			1.10
3. Electricity distribution privatisation		4.00	4.00			4.00
4. Gas distribution privatisation		2.00	2.00			2.00
5. TA for programme implementation		0.50	0.50			0.50
Sub total for sub-proj. 1-5		8.50	8.50			8.50
<i>Phare funded elements</i>						
6. Transmission Grid Investment sub-project						

6.1–Transmission communications	8.80		8.80			8.80
6.2EMS and SCADA	6.10		6.10			6.10
6.3Commercial market operator	3.00		3.00			3.00
6.4 GIS/ MIS for transmission	2.50		2.50			2.50
<i>IFI funded elements</i>						
- Transmission system improvement					81.3 (EIB)	81.3
- Telecoms backbone terminal equipment				3.40	21.1 (EBRD)	24.5
- Metering devices				3.7	24.3 (EBRD)	28
- Other, including VAT and interest				40.6	6 (EBRD)	46.6
Sub - Total for sub-project 6	20.40		20.40	47.7*	132.7*	200.8
<b>Overall Total</b>	<b>20.40</b>	<b>8.50</b>	<b>28.90</b>	<b>47.7</b>	<b>132.7</b>	<b>209.3</b>

*\* The overall investment project is parallel financed by EBRD (51.4 M EUR), EIB (81.3 M EUR), NPGC (national financing- 47.7 M EUR) and Phare (28.9 M EUR)*

## 6. Implementation Arrangements

This project will be managed under the Decentralised Implementation System (DIS), through the National Fund. The Central Finance and Contracting Unit will be the Implementing Agency and, thus, responsible for tendering, contracting, payments and financial reporting in accordance with Phare DIS procedures. The contact details of the CFCU are as follows:

Central Finance and Contracts Unit  
Ministry of Finance Romania  
36-38 Str. Mendeleev, 4<sup>th</sup> Floor  
Sector1, Bucharest  
Tel: +40 1 310 3772  
Fax: +40 1 315 3536

The technical co-ordination and supervision of the investment building sub-projects 1-5 are the responsibility of the Directorate General for European Affairs of the Ministry of Industry and Trade (MoIT).

Ministry of Industry and Trade  
152 Calea Victoriei  
Bucharest 1  
Tel: +40 1 650 3029  
Fax: +401 211 1560  
Contact: Mrs Steluta Goanta, Deputy Director General.

The technical co-ordination and supervision of investment sub-project 6 - the Transmission Grid sub-project, will be the responsibility of the NPGC, who will establish a PIU for the implementation of this project. Technical assistance for this PIU will be provided through a sub-project (TA for implementation) under the institution building component of the project.

## **7. Implementation Schedule**

### **Electricity and Heat Regulator (sub-project 1)**

TOR prepared by end November 2000. Tendering to start from February 2001.

Project activity to start June 2001.

Project activity to be completed end March, 2002

### **Gas Regulator (sub-project 2)**

TOR prepared by end October 2000. Tendering to start from January, 2001.

Project activity to start May 2001.

Project activity to be completed end May, 2002.

### **Electricity distribution privatisation (sub-project 3)**

TOR prepared by end November 2000. Tendering to start from February 2001.

Project activity to start June 2001.

Project activity to be completed end February 2002

### **Gas distribution privatisation (sub-project 4)**

TOR prepared by end November 2000. Tendering to start from January 2001.

Project activity to start June 2001.

Project activity to be completed end March, 2002.

### **TA for programme implementation (sub-project 5)**

TOR prepared by end October 2000. Tendering to start from December 2000.

Project activity to start April 2001.

Project activity to be completed end September 2002.

### **Transmission grid investment (sub-project 6)**

Technical specifications prepared by end October 2000. Tendering to start January 2001.

Project activity to start May 2001.

Project activity to be completed by end August, 2002.

## **8. Equal Opportunity**

Equal opportunity for men and women to participate in all projects will be ensured. Indicators will be elaborated to assess the extent of women's participation in projects.

## **9. Environment**

No environmental screening or environmental impact report has been produced. However, none of these investments would have any substantive effect on the environment, since no new transmission lines are foreseen to be constructed under this programme.

## **10. Rates of return**

The development of an EMS/ SCADA system and improved communication links brings a number of benefits, which largely arise through:

- Cost savings associated with the de-manning of substations (automation)
- Reductions in non-supplied energy
- Improved economy of operations through more efficient dispatch of generation and a consequent reduction in fuel usage and in system losses.

A recent study<sup>1</sup> concluded that computer based dispatch of generation, and the minimisation of the system losses which stem from this improved dispatch, can yield savings of 2-5% in generation costs. In addition labour costs can be reduced through the improved telecommunications and national dispatch. Taken together the ESBI study concluded that a programme of investment in improved telecommunications and a national dispatch (SCADA) upgrade would yield an IRR of 10%. This did not include any allowance for leasing of unused fibre optic capacity to third party users.

## **11. Investment criteria**

### **11.1 Catalytic effect**

This programme of investments has a very significant catalytic effect. Without these investments the creation and then operation of a power market, and hence a fundamental part of the power sector restructuring, could not take place. With the present metering, communications, and control infrastructure NPGC cannot operate a power market, which is required both by law and by the logic of restructuring.

### **11.2 Co-financing**

The investment sub-project is a part of the overall transmission investment programme, which will be co-financed by the EBRD, EIB, NPGC own sources, and Phare. The present proposed investment programme has a total value of 200.8 M EUR, of which 132.7 M EUR would be EBRD and EIB loans (66 %), 20.40 M EUR Phare grant (10 %), and 47.7 M EUR (24 %) NPGC's own contribution.

### **11.3 Additionality**

The availability of important Phare support will act as an encouragement to NPGC to accept the whole package of support, and hence finalise negotiations on the EBRD/EIB loans. Negotiations have taken 2 years so far, and there is a very strong indication that a lack of support from Phare would cause NPGC to continue to vacillate and delay.

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<sup>1</sup> 'Study of CONEL's Transmission Reinforcement Requirements'. ESBI Engineering Ltd. December 1999 (funded by EBRD loan).

## 11.4 Project readiness and Size

The total investment to be funded through this overall project is 200.8 M EUR, of which Phare would fund 20.40 M EUR (10%). Several studies have already been undertaken in preparation for this investment programme (listed under Section 3.2) covering the financial justification, the telecommunications needs, and the transmission system needs. The final study (Preparation of a Business Plan for the NPGC) which will prepare the technical specifications for parts of this investment programme, is currently underway.

## 11.5 Sustainability

The investments funded under this project will become an integral part of the electricity transmission system and commercial market system, and as such the project are fully sustainable after the end of the project. Ongoing maintenance and operation costs will be borne by NPGC, as the national transmission and dispatch company.

## 11.6 Compliance with state aids provisions

Electricity transmission is a natural monopoly, and as a result the issue of distortion of competition through state aid to NPGC does not arise. There is no conflict between this proposal and the state aid provisions of the Europe Agreement.

## 12. Conditionality and sequencing

### Gas sector (sub-projects 2 and 4)

Conditionality	To be met by:
Determination of the number and geographical scope of the number of regional gas distribution companies to be created.	January 2001
Selection of 2 regional gas distributors to be privatised with the agreement of the European Commission and the Ministry of Industry and Trade	March 2001

### Electricity sector (sub-projects 1, 3 and 6)

Conditionality	To be met by:
The National Transmission Company (NPGC) should be legally established	Before first disbursement
A sector reform strategy, including a detailed timetable, must be developed and issued by the Ministry of Industry and Trade.	Before first disbursement
<b>Signature and entering into force of the EIB and EBRD loan agreements</b>	Before first disbursement
Selection of 4/5 regional electricity distribution companies to be privatised with the agreement of the European Commission and Ministry of Industry and Trade.	November 2000



Progress satisfactory to the Commission in the privatisation of Constanza and Timisoara electricity distribution companies	January 2001
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For information, EBRD and EIB conditionalities for the investment sub-project (sub-project n°6) are the following:

<b>EBRD/EIB Conditionalities</b>	<b>To be met by:</b>
The National Transmission Company (NPGC) should be legally established	Before loan signature
ANRE to have agreed project investments are eligible; Transmission tariff methodology that allow a tariff sufficient to cover project investment levels and provide adequate debt service coverage in place	Before loan signature
Cross-effectiveness with EIB	Before first disbursement
Business Plan should be approved by the Bank/NPGC	Before first disbursement
Establishment of Project Implementation Account	Before first disbursement
Establishment of Project Implementation Unit within NPGC	Before first disbursement

#### **ANNEXES TO PROJECT FICHE**

1. Logical framework matrix in standard format.
2. Detailed implementation chart.
3. Contracting and disbursement schedule by quarter for full duration of programme
4. Reference to feasibility study

<b>Annex 1 : Logframe matrix</b>				
<b>Title: Restructuring and the introduction of competitive markets in the energy sector</b>			<b>Contracting period expires:</b> 30.11.2002	<b>Disbursement period expires:</b> 30.11.2004
<b>Project Fiche RO-0005.01</b>			<b>Total Budget:</b> 209.3 M EUR	<b>Phare contribution:</b> 28.90
<b>Wider objective:</b> Realise fundamental market based restructuring and reform of the energy sector Address problems of under-investment, poor financial health, poor financial discipline of energy sector.	<b>Indicators of achievement</b> - Legal unbundling - privatisation in gas and electricity distribution - creation and operation of markets in electricity and gas	<b>How, when and by whom indicators will be measures</b> Ministry of Industry and Trade Electricity and Heat Regulatory Authority (ANRE) Gas Regulatory Authority (ANRGN)	<b>Assumptions and Risks</b> - necessary and continued political will to carry through the restructuring and overcome resistance from energy suppliers - necessary political will to carry through the privatisation	

<b>Immediate objectives</b>	<b>Indicators of achievement</b>	<b>How, when and by whom indicators will be measures</b>	<b>Assumptions and Risks</b>
Consolidation and strengthening of the electricity and heat regulatory authority	-		-
Consolidation and strengthening of the electricity and heat regulatory authority	Creation and operation of an electricity wholesale market in conformity with the electricity single market directive	Ministry of Industry and Trade, ANRE, by mid-2001	Continued political will to restructure the electricity industry, with legal unbundling of generation, transmission and distribution.
Consolidation and strengthening of the gas regulatory authority	Creation and operation of a gas wholesale market in conformity with the gas single market directive.	Ministry of Industry and Trade, ANRGN, by mid 2001.	Continued political will to restructure the gas industry, with legal unbundling of production, transmission and distribution.
Completed privatisation of 4/5 regional electricity distribution companies to enable a critical mass of private ownership in electricity distribution.	Completed privatisation transactions.	Ministry of Industry and Trade, by end 2001.	Successful privatisation of the first two distribution companies (under Phare 98 funding) and continued political will to proceed with further privatisation in the sector.
Completed privatisation of 2 regional gas distribution companies	Completed privatisation transactions	Ministry of Industry and Trade by end of 1 <sup>st</sup> Q. 2002.	Legal unbundling of the gas sector Creation of separate regional gas distribution companies as legal and functional entities Political will to carry through privatisation in gas distribution

To help establish an independent national power transmission company as a common carrier for electricity, in order to enable competition to be introduced into power supply.	Operation of functional unbundling, with transactions between generators and distributors governed by commercial relations.	Ministry of Industry and Trade, ANRE, by mid 2001..	Cooperation of the transmission company in the transformation from 'controller' of the industry to being a system operator. Continued political will to bring about legal and functional unbundling of the sector.
To establish a commercial market operator and create a working wholesale market in electricity.	Operation of a functioning wholesale market in electricity.	Ministry of Industry and Trade, ANRE, by mid 2001..	Continued political will to implement the requirements of the Electricity Law. Cooperation of NPGC in establishing commercial market operator.
To progress in meeting the technical standards for Romania joining the interconnected European electricity network (UCTE).	Requirements for strengthened interconnections and grid strengthening met.	Ministry of Industry and Trade, ANRE, NPGC, and Technical Committee of UCTE. By end 1 <sup>st</sup> quarter 2002.	Conditionalities for EBRD/ EIB/ Phare funding for transmission loan project are met. Investment project is completed on schedule.

<b>Outputs</b>	<b>Indicators of achievement</b>	<b>How, when and by whom indicators will be measured</b>	<b>Assumptions and Risks</b>
		-	-
Regulations governing the operation of a market-based electricity system, including the operation of a wholesale electricity market, in accordance with the gas single market directive.	Regulations and operational rules for the power market.	ANRE, Ministry of Industry and Trade, by mid 2001.	Continued implementation of Electricity Law and unbundling of the electricity sector.
Regulations governing the operation of a market based gas system, including the operation of a wholesale gas market, in accordance with the gas single market directive.	Regulations and operational rules for the gas market.	ANRGN, Ministry of Industry and Trade, by mid 2001.	Enablement of the Gas Regulatory Authority, and unbundling of the gas sector.
Privatised 4/5 regional electricity distribution companies.	Completion of the sale and transfer of ownership of the companies.	Ministry of Industry and Trade, by end of 2001..	Successful completion of the first two distribution privatisations (funded under Phare 1998). Political will to continue privatisation in the sector..
Privatisation of 2 regional gas distribution companies.	Completion of the sale and transfer of ownership of the companies.	Ministry of Industry and Trade, by end 1 <sup>st</sup> Quarter, 2002.	Legal unbundling of the gas sector Creation of separate regional gas distribution companies as legal and functional entities Political will to carry through privatisation in gas distribution
Functioning independent national power grid company operating as system operator	Working power market which meets the requirements of the		

	electricity single market directive.		
Functioning commercial market operator and wholesale market in electricity.	Working power market which meets the requirements of the electricity single market directive.		
Transmission system that is capable of operating safely and reliably within a market based context.	Working power market which meets the requirements of the electricity single market directive.		
Successful preparation and implementation of the sub-projects within this programme realised through technical assistance to the Implementing Authority..	Outputs/ results of projects are realised on schedule.	OMAS, monitoring and auditing.	Assumptions and risks related to all projects within this programme.

<b>Inputs</b>	<b>Indicators of achievement</b>	<b>How, when and by whom indicators will be measured.</b>	<b>Assumptions and Risks</b>
Technical assistance in the drafting of the detailed norms and regulations for the electricity market; provision of hardware and software for system monitoring database. Budget: 0.9 M EUR	<ul style="list-style-type: none"> <li>- Drafted regulations and norms and operating database system.</li> <li>- Operating wholesale electricity market.</li> </ul>	Ministry of Industry and Trade, ANRE.	Delays in contracting. Cooperation of counterpart institution (ANRE).
Technical assistance in the drafting of the detailed norms and regulation, provision of hardware and software for the monitoring of the gas market operation. Budget 1.1 M EUR.	<ul style="list-style-type: none"> <li>- Drafted regulations and norms.</li> <li>- Operating competitive gas market.</li> </ul>	Ministry of Industry and Trade, ANRGN.	Delays in contracting. Cooperation of counterpart institution (ANRGN).
Technical assistance from privatisation advisers to prepare the 4/ 5 electricity distribution companies for privatisation, and then undertaking and completing the privatisation. Budget 4 M EUR.	Completed privatisation transactions.	Ministry of Industry and Trade.	Delays in contracting. Delays in project implementation caused by difficulties of information gathering and privatisation sale negotiation.
Technical assistance from privatisation advisers to prepare the 2 gas companies for privatisation, and then undertaking and completing the privatisation. Budget 2 M EUR.	Completed privatisation transactions.	Ministry of Industry and Trade.	Delays in contracting. Delays in project implementation caused by difficulties of information gathering and privatisation sale negotiation.
Technical assistance for the Ministry of Industry and Trade to prepare and then implement the four institution building and five investment sub-projects within this programme. Budget 0.5	Contracted IB and investment projects, and satisfactory monitoring of both IB and investment projects.	Ministry of Industry and Trade, NPGC, EBRD.	Delays in contracting.

M EUR.			
Procurement, installation, and commissioning of improved communication links. 8.8 M EUR	Successful commissioning and operation.	PIU of NPGC, EBRD, Ministry of Industry and Trade	<ul style="list-style-type: none"> <li>- Difficulties and delays in contracting</li> <li>- Delays and technical risks in project implementation</li> </ul>
Procurement, installation, and commissioning of improved EMS and SCADA systems. Budget 6.10 M EUR.	Successful commissioning and operation.	PIU of NPGC, EBRD, Ministry of Industry and Trade	<ul style="list-style-type: none"> <li>- Difficulties and delays in contracting</li> <li>- Delays and technical risks in project implementation</li> </ul>
Procurement of the hardware and software to enable the commercial market operator to be established and become functional. Budget 3.0M EUR.	Successful commissioning and operation.	PIU of NPGC, EBRD, Ministry of Industry and Trade	<ul style="list-style-type: none"> <li>- Difficulties and delays in contracting</li> <li>- Delays and technical risks in project implementation</li> </ul>

<b>Inputs (continued)</b>	<b>Indicators of achievement</b>	<b>How, when and by whom indicators will be measured.</b>	<b>Assumptions and Risks</b>
Procurement, installation, and commissioning of GIS/ MIS systems. Budget 2.50 M EUR.	Successful commissioning and operation.	PIU of NPGC, EBRD, Ministry of Industry and Trade	<ul style="list-style-type: none"> <li>- Difficulties and delays in contracting</li> <li>- Delays and technical risks in project implementation</li> </ul>

<b>ANNEX 2</b>		<b>Detailed Implementation Schedule</b>															
		Title: Restructuring and the introduction of competitive markets in the energy sector – Project number: RO-0005.01															
		2001				2001											
		Sept	Oct	Nov	Dec	Jan	Feb	Mar	April	May	June	Jul	Aug	Sept	Oct	Nov	Dec
<b><i>Consolidation of Electricity Regulatory Auth. (sub-project 1)</i></b>																	
Preparation of TOR																	
Approval of Tender Documents																	
Tender Period																	
Tender Evaluation																	
Contracting																	
Endorsement of Contract																	
Signature of Contract																	
Beginning of Services																	
<b><i>TA for the Gas Regulatory Authority (sub-project 2)</i></b>																	
Preparation of TOR																	
Approval of Tender Documents																	
Tender Period																	
Tender Evaluation																	
Contracting																	
Endorsement of Contract																	
Signature of Contract																	
Beginning of Services																	
<b><i>Further electricity distribution privatisation (sub-project 3)</i></b>																	
Preparation of TOR																	
Approval of Tender Documents																	
Tender Period																	
Tender Evaluation																	
Contracting																	
Endorsement of Contract																	
Signature of Contract																	
Beginning of Services																	
<b><i>Gas distribution privatisation (sub-project 4)</i></b>																	
Preparation of TOR																	

Approval of Tender Documents																
Tender Period																
Tender Evaluation																
Contracting																
Endorsement of Contract																
Signature of Contract																
Beginning of Services																
<b>TA in programme implementation (sub-project 5)</b>																
Preparation of TOR																
Approval of Tender Documents																
Tender Period																
Tender Evaluation																
Contracting																
Endorsement of Contract																
Signature of Contract																
Beginning of Services																
<i>Investment (sub-project 6)</i> Transmission Grid Project																
Preparation of projects (tech specs)																
Approval of Tender Documents																
Publication of tender announcement																
Tender period																
Tender Evaluation																
Contracting																
Endorsement of Contracts																
Signature of Contracts																
Beginning of works																



### Annex 3

**CUMULATIVE QUARTERLY CONTRACTING SCHEDULE in Euro/€**  
 Title: Restructuring and the introduction of competitive markets in the energy sector

Projects Sub-Projects	Expected Contractual Commitments ( Quarters)													Budget Allocation (Phare Funds) (Meuro)
	I- IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	
	2000	2001				2002				2003				
<i>IB sub-projects 1 - 5</i>														<b>8.50</b>
- Regulatory authority for electricity and heat (1)			0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
- Regulatory authority for gas (2)			1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10	1.10
- Elec. distribution privatisation (3)			4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00	4.00
- Gas distribution privatisation (4)				2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00	2.00
- TA in prog. Implementation (5)				0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50
<b>Investment sub-project n°6 – Transmission grid</b>														<b>20.40</b>
- Communication links				8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80	8.80
- EMS and SCADA systems				6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10	6.10
- Commercial operator				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
- GIS/ MIS systems				2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
<b>Total (Phare funds)</b>			<b>6.00</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>	<b>28.90</b>

**CUMULATIVE QUARTERLY DISBURSEMENT SCHEDULE in Euro/€**

Projects Sub-Projects	Disbursement (Payment) Schedule ( Quarters)																Budget Allocation (Phare Funds)
	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	
	2000				2001				2002				2003				
<i>IB sub-projects</i>																	
- Regulatory authority for electricity and heat (1)							0.135	0.390	0.645	0.900	0.900	0.900	0.900	0.900	0.900		0.900
- Regulatory authority for gas (2)						0.165	0.477	0.788	1.100	1.100	1.100	1.100	1.100	1.100	1.100		1.100
- Elec. distribution privatisation (3)						0.800	1.867	2.933	4.000	4.000	4.000	4.000	4.000	4.000	4.000		4.000
- Gas distribution privatisation (4)							0.400	0.933	1.400	2.000	2.000	2.000	2.000	2.000	2.000		2.000
- TA in prog. Implementation (5)						0.100	0.100	0.233	0.233	0.233	0.367	0.366	0.366	0.500	0.500		0.500
<b>Investment sub-project n°6– Transmission Grid</b>																	
- Communication links							5.340	5.340	3.490	8.010	8.010	8.010	8.010	8.800	8.800		8.800
- EMS and SCADA systems							3.660	3.660	5.490	5.490	5.490	6.100	6.100	6.100	6.100		6.100
- Commercial operator							1.800	1.800	2.700	2.700	3.000	3.000	3.000	3.000	3.000		3.000
- GIS/ MIS systems							1.500	1.500	2.250	2.250	2.500	2.500	2.500	2.500	2.500		2.500
<b>Total (Phare)</b>					<b>0.000</b>	<b>1.065</b>	<b>15.278</b>	<b>17.578</b>	<b>21.308</b>	<b>26.683</b>	<b>27.367</b>	<b>27.976</b>	<b>27.976</b>	<b>28.900</b>	<b>28.900</b>		<b>28.900</b>

## **Annex 4**

### **Feasibility study (ESBI study – March 2000)**

Title: Restructuring and the introduction of competitive markets in the energy sector

## **0. EXECUTIVE SUMMARY**

### **0.1. BACKGROUND**

The national electricity supply system of Romania is currently being restructured with the aim of creating a group of legally and financially independent generation, transmission and distribution companies. The principal aim of this restructuring is to attract private sector financing and consequently to reduce Government obligations to invest in the energy sector. Another aim, consistent with the Government policy of making Romania eligible for membership of the European Union, is to make the supply system eligible for membership of UCPTE (the interconnected European power-exchange network) so that it may offer its customers quality services at prices comparable to those charged on the European market and so that it may participate in the regional energy trading and offer transmission services to neighbouring electricity supply systems. As an initial step the electricity supply system has been incorporated as the Compania Nationala de Electricitate S. A. (the National Electricity Company of Romania) or CONEL and has been divided into a number of strategic business units, one of which, CONEL T & D, is responsible for transmission and despatch.

In recent years various studies have been carried out by international consultants on CONEL's transmission system and several are currently in progress.

CONEL has now retained ESB International to review the existing studies, and to update the data on the investments recommended therein in the light of the current outlook on the projected evolution of electricity consumption and generation, and of the new organisational structures in CONEL. This new study, *Study of CONEL's Transmission Reinforcement Requirements*, is required to report on

- the current condition of equipment
- the issues with respect to the necessary interfaces and the development of a Grid Code arising from the new organisational structure of CONEL
- the requirements for development of the system and the rehabilitation of the equipment thereon
- a suitable summary annual investment plan for the transmission system
- the average transmission tariff necessary to cover the investment needs
- prioritisation of the reinforcement and rehabilitation measures proposed

- the financial aspects of the transmission enterprise for each year up to 2010.

The Terms of Reference for the study are given in Appendix 1.2.

Outputs from this study and from other studies are to be included in a Business Plan of CONEL, to be prepared later this year.

The technical requirements for the CONEL T&D system relate to

- the condition and adequacy of the power equipment on the system
- the measuring equipment required to meet the new circumstances
- system operation and telecommunication equipment
- the establishment of system operating practices to suit the new circumstances

and the financial requirements relate to

- the establishment of a suitable summary annual investment plan for the transmission system
- the average transmission tariff necessary to cover the investment needs
- prioritisation of the reinforcement and rehabilitation measures proposed
- the financial aspects of the transmission enterprise for each year up to 2010.

## **0.2. CONDITION OF EQUIPMENT ON THE CONEL TRANSMISSION SYSTEM**

Transmission system performance is at present very good, but the system is characterised by:

- poorly manufactured and, therefore, unreliable equipment, and
- a continuing need for large numbers of skilled personnel for operation and maintenance.

This means that the CONEL T&D system is incapable of supplying at a satisfactory level of reliability more than a fraction of its designed capacity and that even this level of performance is possible only because wages are so low.

In the future, CONEL's situation can only get worse because:

- the reliability performance of the equipment, already bad, will deteriorate further with increasing age (there are indications that this is already beginning to happen);
- the system load can be expected to rise, albeit slowly, putting increasing pressure on the system;

- wage rates can be expected to rise as the Romanian economy recovers. This will both increase the cost of operation and maintenance and progressively deprive CONEL of skilled personnel.

ESBI recommend that CONEL T&D

1. urgently investigate observed indications of deterioration in equipment reliability, and, if these are confirmed, take the steps which are considered necessary to stabilise the situation;
2. begin as soon as possible a programme of systematic replacement of unreliable equipment and components, both in substations and on overhead lines – the estimated cost of this would be about US\$780 million spread over ten years to 2010;
3. ensure that the selection process for replacement equipment and components be designed to exclude from consideration bidders who cannot convincingly demonstrate their ability to provide goods and services of acceptable quality.

### **0.3 PROPOSED DEVELOPMENT OF GRID CODE**

The Grid Code is a key document, the aim of which is to promote and empower secure and economic operation of the Power System, for the benefit of all Users, in accordance with Government legislation. The objectives of a Grid Code are to:

- supply a set of rules and standards to provide for access to the transmission system;
- establish the responsibilities and obligations of the System Operator and all Users of the transmission system;
- specify the performance requirements to ensure that the technical performance of the interconnected power system is adequate;
- establish procedures for scheduling and dispatch of generation units in accordance with the market rules;
- set design and technical requirements for connection to the transmission system and quality of supply standards that apply at points of connection to a transmission system;
- provide for transmission system development; and
- provide for interface and information flows to support the above objectives.

The System Operator is best positioned to prepare an interim Grid Code, given its level of power system knowledge, operational experience of the Romanian power system, fiduciary duties to all users of the transmission system, and its strategic positioning within the Electricity Supply Industry of Romania. The Grid Code should be prepared on the basis of the following assumptions:

- that initially, there will be an interim version of the Grid Code;
- that a final market structure has not been agreed; and
- that, in due course, a 'full' Grid Code will be developed. Upon full structures coming into force, the general conditions should be amended accordingly.

In the preparation of the Grid Code it is recommended that:

- Chapter 8 and 9 of standard PE 117/1992 ('1992 Dispatch Instructions') should be reviewed;
- planning procedures should be reviewed to provide for a 'Forecast Statement';
- CONEL keep the Grid Code independent of asset ownership, as it is essentially an operations document and there is uncertainty in relation to ownership;
- policy with respect to such matters as restoration plans should be outside the Grid Code though referenced in it, since what the final Grid Code text contains will be difficult to change insofar as it will be subject to a review panel;
- the Metering Code be a stand-alone document apart from, and congruent with, the Grid Code;
- CONEL use a project management approach to Grid Code development, appoint a project manager and define a project charter to give the project the necessary organisational support;
- training of operational staff should be included in the Grid Code project scope;
- six months be the minimum project duration if consultation is required;
- as soon as a credible interim Grid Code has been developed, the consultation process should be widened to include Distributors, Generators, and other stakeholders; and
- a similar format to those used by the Irish and German Grid Codes be used with respect to system services.

#### **0.4 REVIEW OF DEMAND FORECASTS**

In early 1995 it appeared that electricity demand was beginning to recover from the severe decline it had suffered between 1989 and 1994. The Romanian economy appeared to be expanding again, with positive GDP growth from 1993. Unfortunately, by the end of 1996 it was evident that the demand growth was falling again, and the out-turn for 1997 was almost 8% below the 1996 figure. 1998 produced a further decrease by almost 6%.

Current outlook is that the prospect of recovery is poor. It seems quite likely, in fact, that CONEL's rather pessimistic forecast of -8% growth for the year may well prove correct.

Forecasts of economic growth are equally gloomy. For 1999 the National Forecasting Commission estimates a further fall in GDP of 5.4%, even more pessimistic than the recently published estimate from the EBRD, which suggests a fall of 2.6%.

The medium forecast of the National Forecasting Commission gives zero growth of GDP for 2000. It is to be presumed that this expectation of a halt to the economic decline of the preceding three years is based on the assumption of replacement of older inefficient industries by new efficient ones with much higher productivity, and of further increase in commercial activity and services, already obviously quite vigorous. It is quite possible that a halt in the decline of GDP may not be reflected immediately in the electricity demand growth-rate. The closing down of inefficient heavy industries, and their replacement by efficient ones, are quite likely to lead to a reduction in electricity demand rather than an increase.

Each of the three scenarios – maximum, medium and minimum – of the Power Studies Centre of CONEL's demand forecast assumes that the steady rapid decline in demand from the 1996 level will stop, or even begin to reverse, in the year 2000. Also both the medium and the maximum scenarios assume the same quite low growth-rate up to 2005. From 2005 they diverge so slowly that by 2010 they differ by less than 2.5%.

It follows that, for the period of main importance for this Study, the first ten years of the new century, the CONEL forecast must be regarded as presenting only two scenarios: a high one, represented by either the 'high' or the 'medium' scenario of the forecast, and a lower one, but not necessarily the lowest possible, represented by the 'low' scenario of the forecast.

*In the longer term, up to 2020, the CONEL high and medium scenarios look rather less plausible as the present level of per-capita consumption of electricity in Romania is very low.*

*The Consultant recommends that for the purposes of this Study the CONEL high scenario be used at least up to 2010. As already stated, the Consultant finds the extension of the high scenario beyond 2010 somewhat implausible.*

## **0.5 REVIEW OF TRANSMISSION SYSTEM REINFORCEMENT REQUIRED**

The fall-off in demand since 1989 and the absence of growth in recent years has resulted in moderate loading on the CONEL T&D system. With the current demand forecast, system loading is projected to rise only moderately over the next ten years with the result that the transmission system planning studies performed by the Power Studies Centre of CONEL, in line with the demand forecast and the current generation development plan, show the need for only one reinforcement: the building

of the Arad-Oradea 400kV Line and the recommissioning at rated voltage of the Oradea-Rosiori 400kV Line. The line would cost US\$26 million and substation work US\$16.3 million.

Transylvania North is connected to the rest of the CONEL system over a 400kV line between Sibiu and Iernut and over two 220kV lines. Loss of the 400kV circuit results in thermal or stability limits being exceeded and at higher load periods may require load to be left unserved. The problem will become more acute as generating plant in the area is decommissioned.

Without reinforcement the supply to Transylvania North fails to meet the planning criteria and the transmission system UCPTE standards. The proposed reinforcement enables the system to meet the criteria, completes the 400kV ring in the North West of the transmission system, and strengthens the ability of the system to participate in the international trading of energy.

The Consultant concurs with CONEL T&D's finding.

## **0.6 NATIONAL DISPATCH CENTRE COMMUNICATIONS REQUIREMENTS**

CONEL T&D is responsible for the operation of the high voltage system in Romania. The dispatching responsibilities are exercised by a two-level hierarchy of control centres, the National Dispatching Centre in Bucharest and five regional dispatch centres, which are responsible for the operation of generation and transmission in their regions.

The responsibilities of the national dispatching system are:

- the forecasting of the aggregate system demand;
- operational management of the transmission system;
- scheduling and dispatch of generation to meet the expected system demand; and
- maintenance of system frequency, voltage and of scheduled interchanges with interconnected countries.

The national dispatching system is responsible for the *safe, secure and market compliant* operation of the power system. Responsibility for the *economic operation* of the power system previously resided with the NDC. However the restructuring of the power market is leading to the transfer of this responsibility to the Commercial Operator and ANRE.

In the context of CONEL acting as the Independent System Operator, its main responsibilities for the *safe, secure and market compliant* operation of the power system will include:

- ensuring reliability of power system operations,



- providing access to the transmission network according to market rules,
- scheduling power flows through the system as contractually agreed,
- managing transmission constraints and congestion points,
- supplying/managing ancillary services such as voltage support, frequency control, reserve margins,
- providing information as may be required by market participants, settlement system, etc. in accordance with the market rules.

CONEL uses Supervisory Control and Data Acquisition (SCADA) systems to supervise and monitor the power network. A modern ABB-manufactured SCADA system has been installed in the NDC, the RDCs will shortly be replaced by similar modern SCADA systems and a re-configuration of the NDC will also be carried out. A limited range of Energy Management System (EMS) software is being installed as part of the development of the re-configured NDC.

Thus CONEL is in the process of installing the essential central hardware and software components of a modern dispatching scheme. However, the situation in the CONEL T&D substations described in Chapter 2 precludes the SCADA facilities from being utilised as yet for remote switching.

As the NDC and RDCs have been equipped (or are in the process of being equipped) with modern SCADA systems, the following subsystems are required to complete the national dispatching system:

- suitable Remote Terminal Units (RTUs) in all 400kV, 220kV, selected 110kV substations and in major power plants;
- selected equipment necessary to support the installation and operation of the RTUs;
- EMS software, and associated hardware, to support CONEL's responsibility for the safe and secure operation of the power system;
- suitable telecommunications links between the dispatching centres and the RTUs; and
- hardware and software to support the commercial operation of the power market.

The cost of the equipment required for the first three of these subsystems (additional RTUs, software and hardware) is estimated to be approximately US\$2.8 million. Other consultants are currently studying the telecommunications needs of CONEL – the scope of their study includes formulating proposals to meet the real-time data transfer requirements of CONEL's SCADA system. An estimate of the cost of the hardware and software needed to support commercial operation of the power market is given below under *Related Matters*.

## **0.7 PRIORITISATION OF PROPOSED MEASURES**

The following measures are required:

- Rehabilitation of substations - \$481 million
- Rehabilitation of overhead lines - \$185 million
- Installation of metering and market settlements system - \$33 million
- Telecommunication investments - Unknown
- New 400kV development in Transylvania - \$42 million

All are considered by ESBI to be essential to the future of CONEL T&D, but the timescales within which they should be completed differ. A suggested investment plan is set out in Section 0.9, below.

ESBI consider that overhead lines rehabilitations would be a suitable investment for financing by a loan from EBRD/EIB. This item is chosen because:

- if this work is not done the rate of overhead line failures is expected to rise rapidly and threaten the integrity of the system.
- the project would be technically simple, and easy to control. The process of specification, enquiry, bid evaluation, and contract award therefore should be straightforward and rapid.
- the timescale would be short. ESBI are advised that the state of the existing insulators and shield wires is such that the project should be completed within five years.
- the total value of the work is not expected to exceed \$200 million.

## **0.8 AVERAGE TARIFF NECESSARY TO COVER INVESTMENT NEEDS**

As a first step in the development of a tariff structure for CONEL T&D, ESBI has derived an average value for a tariff for the period 2000 to 2010 sufficient to cover CONEL's investment needs. The average tariff, also known as a 'postage stamp' tariff, is based on the depreciated replacement value of the existing assets, operation and maintenance costs, the cost of losses and the value of future investments proposed by ESBI and Teleconsult.

The annual transmission tariff is designed to recover the total cost of the Transmission and Dispatch business. T&D costs consist of both the fixed costs of the transmission network and the variable costs associated with running a secure transmission system. As it is envisaged that the cost of the ancillary services, system support services and the cost of transmission constraints will be charged to users as part of a separate ‘uplift’ component, these costs are not included as part of the tariff derived in this section.

The annual postage stamp tariff is set to fully recover the total fixed and variable costs of the T&D business. Although under the current regime the transmission system is defined as a ‘public’ good, for the purpose of this study the Consultant has assumed that, like any ‘normal’ transmission company, the cost of these assets is fully recoverable and so the annual depreciated cost is charged to customers, as part of the transmission tariff.

Given the annual total recoverable cost, the postage stamp tariff level is derived by dividing total annual costs by an amount reflecting the total usage of the transmission system. At present all charges are levied based only on an energy fee. However, because the transmission system is designed to meet capacity/peak demand the Consultant believes that it is important to charge at least part of the costs of the transmission network on a capacity/peak basis. For this reason it has been assumed that 50 per cent of the cost is charged based on a capacity component and the remaining 50 per cent charged based on an energy component

In order to derive the annual postage stamp tariff it is also necessary to decide on how to allocate the transmission costs between generation and load. For the purpose of this study a 50:50 split between generators and load customers has been assumed. Although the current practice is to charge load the full cost of the transmission system, if Generators are not eligible to pay transmission charges in the restructured environment, then it will not be possible to send locational signals to new Generators connecting to the transmission system in the future.

***Table 0.1 shows the average tariff forecast to be required to fully recover the costs of the transmission system including the cost of all future investment requirements as outlined in Chapter 9.***

There is a range of analytical/policy issues which need to be addressed before the approved transmission pricing approach is implemented. These include:

- how to create an efficient locational signal for new Generators;
- pricing of cross border flows;
- nature of access (firm, non-firm or a mix);
- split of charges between generators and demands;
- treatment of ‘embedded’ generators. A significant amount of generation in Romanian is embedded in the distribution system. In this study it has been assumed that these Generators do not pay transmission charges. However, if the transmission system is designed to cater for embedded generation then an argument could be made that these Generators should pay transmission tariffs.
- possible regulatory risk associated with ‘stranded’ transmission assets;
- inter-relationship with the energy market – i.e. treatment of transmission losses and constraints and ancillary services;
- Nodal versus Zonal pricing.

*In the context of the forth-coming negotiations with the Regulator, pricing issues which will require regulatory approval include:*

- opening regulatory asset base including treatment of capital contributions;
- depreciation life of assets;
- transmission pricing methodology;
- methodology used to recover losses, system support services, ancillary services and constraints;
- WACC and its constituents;
- Operation and maintenance costs.

**Table 8.1 Transmission Tariffs (Base-Case Prices)**

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
<i>Scenario 1: Proposed Charging approach</i>												
<u>50 per cent energy</u>												
load	0.0027	0.0025	0.0022	0.0023	0.0023	0.0024	0.0024	0.0025	0.0024	0.0024	0.0024	0.0023
Generation	0.0025	0.0024	0.0021	0.0021	0.0022	0.0023	0.0023	0.0024	0.0023	0.0023	0.0023	0.0022
<u>50 per cent capacity</u>												
load	15.2627	15.2155	13.2210	13.5872	14.0037	14.2426	14.5317	14.3059	14.0543	13.8376	13.6693	13.5214
Generation	7.5591	7.5357	6.6836	7.0081	7.3666	7.6384	7.9426	8.1308	8.2940	8.4676	8.6624	8.8633
<i>Scenario 2: Demand pays 100 per cent</i>												
100% cent Energy (kWh)	0.0106	0.0099	0.0087	0.0090	0.0093	0.0096	0.0098	0.0099	0.0098	0.0096	0.0095	0.0093

## **0.8 INVESTMENT PLAN**

Table 0.9.1. sets out ESBI's proposals for the pattern of expenditures over the years 2000 through 2010. This table presents

- investments in necessary rehabilitation of substations and lines;
- investment in a new 400k line from Arad to Oradia, plus associated substations and lines work;
- investment in metering and market settlement systems;
- investments in SCADA and telecommunications development, including a notional sum for work outside ESBI's Terms of Reference;
- provision for replacement of power transformers as they fail in service;
- estimates provided by CONEL T&D of the funds which they expect to be able to contribute;
- estimates of the amounts which will have to be borrowed in each year.

Item No.	Description	Total \$M	Expenditures in Years 2000 through 2010										
			2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1	Overhead Lines	185	-	37	37	37	37	37	-	-	-	-	-
2	Substations	481	-	-	53.4	53.4	53.4	53.4	53.4	53.4	53.4	53.4	53.4
3	New Developments	42	-	-	-	-	-	-	21	21	-	-	-
4	Metering and Market Settlements System	33	7	9.5	9.5	2.5	2.5	2.5	-	-	-	-	-
5	Telecommunications and SCADA												
	• SCADA	3	-	-	2	.125	.125	.125	.125	.125	.125	.125	.125
	• OPGW Terminations	16	-	-	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8	1.8
	• Other Telecomms work	100	-	-	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1	11.1
6	Provision for Power Transformer Failures	110	10	10	10	10	10	10	10	10	10	10	10
7	Total Expenditure	970	17	56.5	124.8	115.9	115.9	115.9	97.4	97.4	76.4	76.4	76.4
8	CONEL Funds	312	23	24	25	26	27.5	28	29	30	31.5	34	34
9	Loans Required	658	-	26.5	99.8	89.9	88.4	87.9	68.4	67.4	44.9	42.4	42.4

**Table 0.2 – Proposed Expenditures 2001 through 2000**

## **0.10 RATES OF RETURN**

Three proposals were evaluated:-

1. Overhead Lines rehabilitation which would require a total investment of \$185 million, spread over 5 years up to 2005.
2. Substations rehabilitation which would require an investment of \$481 million in the substations, plus further investments of up to, perhaps, \$120 million in telecommunications and SCADA, spread over 9 years up to 2010.
3. A new 400 kV line between Arad and Oradea, with associated substations work at Arad, Oradea and Rosiori, and recommissioning of the Rosiori – Oradea line for operation at 400kV.

ESBI's opinion is that all three projects are essential to CONEL T&D's future, and justifiable in those terms. However, financially quantifiable benefits could be estimated only for Item(3) – the new Arad – Oradea 400kV line. It was possible therefore to calculate an IRR only for this proposal. Given that ESBI has suggested that in order to mitigate the impact of this project on CONEL T&D's cash flow, it be carried out in 2005/7 a very low IRR applies if the new generation plant in Transylvania North is installed as scheduled but a rate in excess of the WACC is earned if the new generation plant is deferred to 2015 or later.

## **0.11 RELATED ISSUES**

### **Metering**

The accurate measurement of electrical energy flow is critical to the operation of a de-regulated electricity market. The unbundling of the traditional vertically-integrated electricity utility creates new boundaries across which energy flow needs to be measured. In the new de-regulated market there is the need to measure at the interface points between generation, transmission and distribution.

Normally, to minimise metering requirements, the boundary between the transmission and distribution systems is set at the step-down transformers. However, given that the physical boundaries of CONEL T&D are the fences of the 400kV and 220kV substations, this will require separate metering of each 110kV distribution line leaving them, in addition to the separate generation infeeds into the CONEL T&D system.

In order to support the electricity market, a metering system must measure electricity flows accurately, reliably and in a secure manner. The metering information collected must be accurate. Metering information must also be sufficiently available, which puts certain demands on the communications infrastructure. The meters must be installed and commissioned to agreed procedures and standards. There may be a need to retro-fit new instrument transformers. In addition to the meters themselves, there are communication facilities, data collection systems, data aggregation and validation systems required. The new metering infrastructure must:



- meet the needs of the market;
- meet the needs of the individual market participants;
- facilitate the development of the market;
- be fair to all participants;
- be cost effective.

A resource plan, for both the implementation of the infrastructure and its future operation and maintenance, should be developed. The implementation of the metering system involves a number of different parties. The project structure must ensure strong project co-ordination and issue resolution.

The ANRE regulation does not appear to specify the need for main and check metering, a normal requirement. However, accuracy classes are specified. Existing metering transformers do not have the required accuracy, nor do they appear to have spare cores for check meters. Replacement of metering transformers is an expensive item and the requirements at each location need to be addressed.

The ANRE regulation calls for hourly metering. The current SCADA system meters current and voltage in selected locations but the Consultant was advised by CONEL that ANRE would not accept energy values integrated from these instantaneous values. It appears that hourly measurements may be required by ANRE from August 1999. However, manual readings are impractical and implementation of an automated system by this deadline is not possible. Clearly, an automated system is needed in the short term. This requires communication facilities from each substation to allow data to be transferred from the metering collators back to the central settlement system. It is unclear if adequate communication facilities exist in all locations.

To calculate a transmission tariff the Consultant is required to estimate investment requirements to 2100. A study of the metering requirement was not included in the Terms of Reference for this Study. However, the following comments can be made.

- As part of the equipment rehabilitation recommendations (see Chapter 2), it is proposed to replace all instrument transformers on a rolling programme. The additional cost to procure metering transformers to include cores to meet ANRE standard is small.
- Communication requirements are part of a separate study. However, it is proposed in this Study to replace over-head ground wires due to quality reasons. Clearly optical ground wires (OPGW) should be procured as replacement, thereby addressing the communication issue
- Meters, collators and a central metering system, will cost a number of millions of dollars and are not significant for purpose of this study.

An initial estimate of the cost of installing the required metering facilities would be:

- |   |   |        |
|---|---|--------|
| • For metering equipment in substations | - | \$12m. |
| • For a market settlements system       | - | \$21m. |

## **Market System**

The aim of the restructuring of the Romanian electricity supply system is to create a market in which electricity will be traded commercially between suppliers and distributors/customers through the mediation of the CONEL T&D transmission system. This will require that CONEL T&D have the necessary communication/electronic facilities to permit the decision-making in the trading process and the settlement process thereafter. The study of this matter is not within the scope of this Study but a preliminary estimate of the cost of the installation of the necessary hardware and software is required so that it may be included in the enumeration of the expenditures to be incurred by CONEL T&D in the near future.

In order to operate as a commercial provider of transmission services (and other services inherent within its role), CONEL will require protocols and systems to discharge its duties in a fair, transparent and auditable manner, which are acceptable to market participants and transmission users, and which satisfy the requirements of the regulatory authorities.

Systems which would be expected to be required under this heading would include:

- Business Systems
- Transmission Use of System: settlement and billing
- Ancillary Services procurement, management, settlement and billing
- Transmission Constraints costing and management
- Interconnector access, pricing and billing

To establish its needs, a review of the legislative and licence responsibilities of CONEL, and the anticipated design of the energy market and its impact in this area will be required. In addition, a review of the business systems and infrastructure within CONEL, and their adequacy for operation in a restructured commercial environment will also be required.

Based on this review a comprehensive plan to address all of the areas listed above will be required.

In order to support the operation of the market and the requirements for transparency and equitability, CONEL will require to procure or develop market operation and settlement systems. The systems needed to support the operation of the market will depend on the interim and final shape of the market. Depending on the structure of the market, systems may be required to address

- participant registration
- bids and offers
- scheduling and dispatch
- compliance monitoring
- settlement

- billing
- market funds administration.

In addition, systems will be required to address ancillary services operation and settlement, transmission use-of-system billing, meter registration, metering and data collection.

The System Operator will have to provide ancillary services such as:

- frequency control,
- voltage control,
- reactive power and
- black start.

Systems will be necessary for the operation and settlement of these ancillary services and for constraints costs and losses.

The cost of market operation systems differs considerably depending on the circumstances of the power system in question and may reach hundreds of millions of dollars, as in a recent study in California. Pending a dedicated study of the Romanian power system to establish a firm estimate of the cost of such a system, the Consultant would be of the opinion that it would be of the order of US\$10-20M and consequently has assumed a cost of US\$15 for the economic analysis in this Study.

#### Telecommunications Study Input

Due to the overlapping of both studies, the expected input from the *Feasibility Study for Modernisation of CONEL's Telecommunications System* being performed by Teleconsult International into this Study was not available and consequently the relevant costs have had to be assumed.

#### Environmental Aspects

The physical effect of the recommendations of this Study may be summarised as the refurbishing or replacement of existing power equipment on the lines (earth wires, insulators) and in the substations (switchgear and instrument transformers, as well as additional/new metering, protection and control equipment) of CONEL T&D, together with the construction of the Arad-Oradea 400kV. With the exception of the new line, none of this work would have any new effect on the environment.

The construction of the Arad-Oradea 400kV Line and recommissioning at rated voltage of the Oradea-Rosiori 400kV Line will be to the advantage of the Romanian system as a whole and to the Transylvania North sector in particular. The reinforcement will, however, have an impact on the individuals, communities, and nature in the region through which it will need to be constructed. Current practice in Western Europe is to study the impact such a major engineering development would have on the

environment so that its design may be optimised and its impact mitigated. Aspects such as the physical, geographical, visual, biological, social and economic effects on individuals, communities, the flora and fauna, the economy, etc will need to be addressed. The public may need to have fears about the effects of the electro-magnetic fields of the line on individuals assuaged. The effect of the line on the farming community and the question of wayleaves and rights of way will require examination.

Such an environmental impact study is likely to be sought by a lending agency before financing this reinforcement.

## **0.12 ACKNOWLEDGEMENTS**

ESB International wishes to express its appreciation of the co-operation it received from CONEL staff during its work and particularly from the Counterparts.