Report on Electricity Industry Restructuring in Romania

by

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1. Introduction

Many aspects of the Romanian electricity supply industry (RESI) make it a potentially attractive candidate for privatization. In order to realize this potential substantial restructuring of the industry must take place. To manage this process and regulate the resulting industry, a credible and transparent regulatory oversight process must be in place from the start. This report describes the necessary features of a successful restructuring process for the RESI in light of the structure of the industry, its present economic health and industry oversight process. The report then describes the regulatory process that is currently in place to manage the restructuring process and regulate the industry. An assessment will be provided of the ability of this regulatory process to manage the transition process and credibly regulate the final entity. Recommendations will then be made for overhauling the regulatory process to best meet the challenges it will face in restructuring the industry and in regulating the entity that results in a manner that maximizes the likelihood of a successful privatization of all components of the RESI.

The remainder of this report proceeds as follows. The next section provides background on the Romanian economy and the structure of its electricity supply industry. This is followed by a section of the current state (as of the Autumn of 1999) of the electricity industry re-structuring process and the regulatory process that governs it. Section 4 compares the costs and benefits of electricity industry restructuring in Romania. After concluding that restructuring offers significant potential benefits, this section describes the essential requirements of a regulatory process that maximizes the likelihood these potential benefits will be achieved. The fifth section compares the current regulatory process to this desired regulatory process and recommends changes in the current process which makes it consistent with the desired process. Section 6 then recommends a multi-step procedure for managing the transition to a privatized industry. Section 7 describes a process for introducing competition into various aspects of the RESI in manner consistent with the European Union directives.

2. Background on Romanian Economy and Electricity Supply Industry

Historically, the vast majority of Romania's electricity was consumed by industrial and commercial users. The economy was dominated by energy-intensive heavy industry during the Communist regime. Many of these industries scaled back production or shut down during the transition from the Communist regime. As a result, annual electricity consumption began a steady decline from roughly 65,000 Gigawatt-hours (GWh) in 1989 to approximately 40,000 Gwh in 1998. The major decline in sales has come from the high-voltage, large industrial customers. Figures 1 and 2 illustrate this phenomenon. Figure 1 shows a steady decline in annual electricity consumption from 1989 to 1994, with a slight upward trend from 1994 to 1996. This trend peaked at 45,000 Gwh in 1996 and has since declined. The yearly distribution of electricity sales across voltage classes from 1989 to 1998 is given in Figure 2. In 1989 almost two-thirds of all energy consumed was sold to high voltage customers. By 1998, this number had declined to less than one-third. Table 1 illustrates the trends in the composition of electricity demand in more detail for the period 1997 to 1998. Total industrial demand fell by 9.28%, with the largest declines in the non-ferrous metals,

paper and paper processing, and chemical and allied industries. Although total services sector demand fell by 2.28%, electricity demand in the banking and insurance sector, hotels, restaurants and theaters sector and the communications sector grew. Household demand experienced only a slight 0.54% increase over this one-year period. Agricultural demand for electricity increased by 3.34%.

For 1998, the industrial and commercial versus residential demand split for electricity was approximately 73% industrial and commercial and 20% residential, although the industrial share was as high as 80% of total demand during the late 1980s and early 1990s. For the United States in 1998, these two numbers are: industrial and commercial, 65% and residential, 33%. Because the level of industrial energy demand is more dependent on the level aggregate economic activity than is residential demand, aggregate electricity demand in Romania is more dependent on the level of economic activity in economy than it is in the countries of Western European and the United States.

Figure 3 plots an index of real gross domestic product (GDP) for Romania for the period 1990 to 1998. The index is normalized to 100 in 1995. The pattern of decline from 1990 to 1994, increase from 1994 to 1996, and subsequent decline from 1996 onward shown in Figure 1 that occurs for total electricity consumption, also occurs for real GDP. Over this same time period, Romania has experienced rapid price inflation. Figure 4 plots the Consumer Price Index (CPI) from November 1996 to March 1999. The value of the CPI is normalized to 100 in October 1990. Over this same time period, the lei/$ exchange rate rose steadily. This is pattern is shown in Figure 5. Figure 6 plots the (real lei)/(nominal $) exchange rate over this time period. This graph shows that domestic prices have increased more rapidly than the rate of increase in the lei/$ exchange rate over this same time period.

If input fuels are priced at their internationally traded US dollar values for each year, delivered electricity prices for the period 1989 to the present have implied extremely low returns to capital invested in the RESI. Although there appears to be some disagreement among sources on the value of the $/MWh delivered price of electricity during the early 1990's, $24/MWh is the best estimate available (see Annex 1.2, World Bank, 1995). Taking the example of steam coal with a typical heat content of 26.67 million BTU/metric tonne (MBTU/ton) as an input fuel and the European price in 1990 of $43.50/ton from the *BP Amoco Statistical Review of World Energy 1999*, yields a price of $1.63/MBTU. Taking the heat rate for a typical coal-fired unit in Romania of 10 MBTU/MWh (S.C. Termoeletrica, 1999, p. 26), yields a variable fuel cost of $16/MWh. Performing this same calculation with an assumed price of lignite of $20/ton, a typical heat content of 13.33 MBTU/ton and typical heat rate for Romanian lignite generating facilities of 12 MBTU/MWH, (S.C. Termoeletrica, 1999, p. 26) yields a similar number for the variable fuel cost for these units. Even a very conservative per unit total transmission, system operation, distribution and retail supply cost of $20/MWh yields an average delivered cost of $36/MWh, which is significantly above the average 1990 delivered price of electricity of $24/MWh.

Another artifact of the former Communist regime is the cross-subsidy in the pricing of delivered electricity from industrial to residential consumers. In 1990, the average retail industrial

tariff was more than twice the average retail residential tariff, with $25/MWh for industrial customers and $11/MWh for residential customers (Annex 1.2, World Bank, 1995). This disparity in pricing has persisted throughout the 1990s, and has only been eliminated very recently. As of September 1999, the average residential price and average industrial price are roughly equal at approximately $42/MWh. According to the National Electricity and Heat Regulatory Authority (ANRE), cross-subsidies from industrial to residential electricity customers were removed with the prices set in October of 1999.

It is also unclear if the current average delivered price of electricity covers the going-forward costs of delivered electricity. For comparison, Table 2 lists the average delivered price of electricity for all US states in 1998. The overall average delivered price for the US is $67/MWh, which is $25/MWh higher than the dollar denominated Romanian price. Comparing the average delivered price of $42/MWh to the average delivered price for all sectors of from various US states yields several insights. First, the only places in the US with comparable delivered prices are Washington, Oregon and Idaho, all of which receive a large fraction of their power from hydroelectric sources. Comparing the Romanian figure to the figure from states with similar fuel mixes such as Texas, Oklahoma, Kansas, Missouri and Iowa, yields a $10 to $20 gap between the US average delivered price and the average delivered price in Romania. Some of this difference can be explained by the fact that a large fraction of US demand is consumed by households. However, this cannot explain the entire gap between average prices in the West North Central states and the average dollar price in Romania. This extremely low delivered price in Romania may explain why many of the Romanian generation, transmission and distribution facilities are in need of repair. All but the most necessary maintenance expenditures have been delayed due to insufficient funds.

Another important aspect of the Romania electricity supply industry is its dependence on co-generation facilities to serve residential and industrial thermal heat demand. Termoelectrica provides approximately 50% of Romania's demand for steam heat, with the vast majority of the remaining heat provided by local municipalities. As a consequence of this large heat demand particularly during the winter months, a large fraction of aggregate electricity demand must be served by co-generation facilities despite the existence of unloaded lower cost electricity generating facilities. Because the typical Romanian 200 MW co-generation facility operates at 160 MW of its electricity generating capacity when it produces its maximum thermal heat output, even when all co-generation facilities are operating at their maximum steam output level, there is still a significant amount of electricity being supplied to the electricity grid. In addition, CONEL staff estimate that the average incremental cost of producing steam from co-generation facilities is approximately $16/gigacalorie (Gcal), whereas the average cost of producing heat from steam-only units is approximately $20/Gcal. On this basis, the economics of producing steam still favors maximum supply from co-generation units.

The pricing of thermal energy historically had cross-subsidies from industrial to residential customers. Managers from the National Electricity Company (CONEL) claim that there is also a cross-subsidy from heat to electricity production in co-generation facilities. The fact that thermal energy is sold to local distribution systems at approximately $12/Gcal and directly to large industrial

customers at close to $20/Gcal is evidence in favor of the existence of this cross-subsidy. This two to one price ratio has persisted at least since1990, when the household price was $3.7/Gcal and the industry price was $7.8/Gcal (Annex 1.2, World Bank, 1995). ANRE states that cross-subsidies from electricity to heat were also substantially reduced in October of 1999. ANRE also states that there currently are no cross-subsidies between industrial and residential hot water customers and price is set at 14.3 $/Gcal for both types of customers.

This uniform price throughout of the country did not previously present significant difficulties for CONEL because of its monopoly supplier status. Emergency Ordinance 63 also allows large industrial customers to build their own heat and electricity facilities. The desire of many large demanders of heat and electricity to be supplied by cheaper dedicated plants has made maintaining this nationwide uniform price more difficult. ANRE has plans to consider the establishment of local heat tariffs.

Further constraints are placed on the electricity dispatch process by the significant domestic lignite and hard coal consumption requirements imposed on the CONEL. Given the declining demand for electricity caused by the significantly reduced demand for the output of Romania's electricity consuming industries, meeting these lignite and coal consumption targets has become increasingly difficult. As a result, these targets have been reduced, resulting in a significant number of layoffs in the lignite and hard coal mining industries. In addition, because of these consumption requirements, it is often the case that there are generating units not operating that have a lower marginal cost of production than many of the lignite and hard coal plants forced to run because of these consumption requirements. Finally, because of a desire for energy self-sufficiency in the former Communist regime, historically lignite was transported large distances along the Romanian railways and burned in plants far from where it was mined. This process resulted in implied delivered prices of lignite to these plants that were more than double the price of lignite delivered to mine-mouth generating facilities. Currently, transportation of lignite over uneconomically long-distances is being phased out.

Table 3 gives the sources and use of all electricity produced in Romania for 1996 to 1998. Consistent with the desire to reduce production from lignite and other fossil generating stations, annual production from thermal facilities has declined from 42,750 GWh to 27,266 GWh from 1996 to 1998, whereas the amount of hydroelectric production has increased from 15,684 GWh to 18,798 GWh. Over this same time period, the amount of electricity produced by other suppliers in Romania increased from 110 GWh to 3,288 GWh. This increased production is primarily by facilities owned by local governments and other government agencies. Line losses in the Romanian electricity network as a percentage of CONEL's net-of-own-use electricity production are comparable to US levels. Annual imports and exports into Romania are a small fraction of total electricity consumption during all years. Given that Romania shares a border with Bulgaria, Yugoslavia, Hungary, Moldovia, and Ukraine, this small amount of imports and exports is particularly surprising. One explanation is that many of these countries also currently have significant excess generating capacity. Figure 7 plots the average hourly capacity used by fuel type from 1989 to 1998. This

figure shows the trends across fuel types illustrated in Table 3 for 1996 to 1998 have been ongoing since 1989.

Table 4 gives the installed capacity available to serve the Romania electricity supply industry as of December 31, 1998. There is a total of 20,447 MW. This should be contrasted with a 1998 peak electricity demand of 9,014 MW which occurred on January 29, 1998. This is slightly below the peak figure for 1997 of 9,505 MW. This table also lists capacity not in use. As of this date, out of the total capacity not in use 1,140 MW is under rehabilitation and 2,752 MW is currently mothballed (National Electricity Company, 1999). Most of this capacity is coal-fired. The remaining one-third is oil-fired. Of the capacity in use, some it was unavailable because of lack of availability of certain generating facilities due to equipment failure. Even with these technical problems, the reserve margin for 1998 defined as the difference between Operational Capacity and Peak Demand divided by Peak demand was 40%, which is double the historical levels in the US. This large amount of excess capacity in the Romania electricity supply industry is borne out by the extremely low capacity factors from 1996 to 1998 given in Table 5. The only fuel type with a capacity factor close to US levels is nuclear during 1997 and 1998. However, both the hydroelectric and thermal facilities are operating at extremely low capacity factors, which is indicative of the large amount of excess generating capacity in Romania. As a result of this excess capacity, CONEL is currently initiating even more rehabilitation and mothballing efforts. It also plans to retire and dismantle some extremely high-cost generating facilities. Despite these low capacity factors, S.C. Termoelectrica, S.A. managed to obtain availability factors that compare favorably with US facilities.[1] Figure 8 plots availability factors for 1998 and 1997 for coal, lignite and natural gas/fuel oil facilities. These availability factors are generally only slightly smaller than comparable values reported by fuel type and plant size by the National Electricity Reliability Council (NERC, 1996) for the US.

Despite these efforts to shutdown and mothball generating units, the age distribution of thermal facilities in Romania compares very favorably with the age distribution in various regions of the US. For example, 6% of thermal plants are between 0 and 5 years old, 10% are between 6 and 10 years old and 37% are between 11 and 20 years old, and 47% are over 21 years old (S.C. Termoeletrica, 1999, p. 13). According to data from the US Energy Information Administration's *Electric Generating Unit Inventory for 1998*, in the New England region of the US, these fractions are 1%, 6%, 12% and 81%. For California these fractions are 2%, 2%, 25% and 71%. Consequently, the tremendous need for rehabilitation of thermal power plants in Romania does not appear to be due to their unusually old age, but a lack of regular maintenance and repair. Combined with the low dollar denominated delivered price of electricity discussed above, the case for inadequate maintenance and repair expenditures becomes even stronger.

[1]An availability factor for a generating unit is defined as the fraction of annual energy that the unit can potentially produce that it is actually available to produce. For example, a unit with 100 MW of capacity has the potential to produce 8760 hr*100 MW = 876,000 MWh in one year. However, because of partial and complete outages of the unit, it may only be available to produce 750,000 MWh. Therefore, its availability factor would be 750,000/876,000 = 0.856. If a unit can only experience complete outages, then the availability factor reduces to the fraction of hours during the year the unit is available to produce electricity.

The thermal heat sector shares many of problems with the electricity supply industry. Table 6 illustrates that a significant amount of thermal heat production capacity is not operational. This is particularly true for hot water production where almost 30% of the capacity is not operational. Figure 9 plots the average hourly capacity used in heat production from1989 to 1998. This figure shows a steady decline in heat production across all sources since 1989. This decline is caused by the general decline in industrial steam requirements due to the economic reform process which has reduced the output of many heavy industries. In addition, some end users have also began constructing their own high efficiency heat sources.

Figure 10 plots the load shapes for a typical winter day and typical summer day. The daily peak period in Romania is not nearly as pronounced as it is in the US and UK. This is indicative of the larger component of industrial electricity demand in Romania relative these two developed countries. Electricity demand during both the typical winter and summer peak hours is virtually flat and coincides with the daytime working hours. Figure 11 plots the load shape for maximum and minimum peak days during 1998. Even during the maximum peak demand day, the highest demand period is not appreciably different from demand during the remaining daytime working hours. During the minimum peak day on July 5, demand is virtually the same during all hours of the day.

The desire for energy self-sufficiency in the former Communist regime led to the initiation of many hydroelectric projects and one large nuclear project that remain largely unfinished. Only the first 706 MW unit of the Cernavoda nuclear facility has been completed and is operational. The short-run marginal cost of producing energy from this plant is approximately $13/MWH. However, the fixed costs associated with constructing this plant and the up-front costs of producing the heavy water necessary to operate the plant, result in a long-run average cost for the facility that is more than triple this amount. This estimate does not account for the anticipated decommissioning costs for this unit. A total of five 706 MW units were planned at Cernavoda, but only the second unit is anywhere close to completion. Currently, it is 48% complete, with an estimated $780 million necessary for completion, including heavy water costs of $130 million. The anticipated opening of this facility has also led to the continued production of the vast quantity of heavy water necessary for it to begin production. In addition, in order to reduce the direct cost of opening Unit 2 and continue operating the heavy water production facility, heavy water is currently priced at $265/kg, relative to its estimated cost of $400/kg.

This continued production of heavy water is at significant expense. Although Unit 1 at Cernavoda consumes some heavy water, this is roughly at a rate of 5 tons per year. However, in order to commission Unit 2, approximately 540 tons of heavy water will be necessary. Consequently, the only reason to continue producing heavy water at the current rate of 135 tons/year is to commission Unit 2. This desire to commission Unit 2 should be viewed in light of the fact the peak demand in Romania during 1998 year was 9,014 MW, and Romania's installed generation capacity as of the end of 1998 is 20,447 MW. In addition, there is also excess capacity in the domestic coal and lignite industries.

Because of the production of many negative value-added electricity-intensive goods in the Romanian economy throughout the 1990s, many firms were unable to pay some or all of their electricity bills. Because cutting off electricity to an industrial customer virtually guarantees that the firm will no longer be financially viable, CONEL must strike a delicate balance in its attempts to collect unpaid bills from these industrial customers. Delinquent payment problems also arise with local municipalities that distribute thermal heat purchased from CONEL. An article in *Nine O'Clock* (Romania's England Language Daily Newspaper) characterized this problem as follows, "Bluntly put, RENEL has become Romania's most profitable bank for credit-seekers who may borrow massively from it without ever repaying the loans. (Ilie Sebanescu, 6/6/98). As a result of requirements to reduce these arrears put on loans and other aid from international funding agencies, payments from industrial customers are currently sufficiently high to be begin to pay down the accumulated bills outstanding. For example, management at Termoelectrica estimates that ratio of total payments received from industrial customers during the month is currently between 105% to 148% of the current month's total electricity sales. However, this is an very recent phenomenon. Termoelectrica management estimates the total arrears obligation to be on the order of 8,000 billion lei or approximately $480 million (at an exchange rate of 16,400 lei/$). Approximately 60% of these arrears are owed by the Romanian steel industry.

Residential customers in Romania create an even more difficult arrears problem. Rapid price inflation in Romania throughout the 1990s makes it increasingly difficult for a large fraction of the retired population to pay their heat and electricity bills. The management of Termoelectrica estimates that ratio of total payments received from residential customers during the month is currently 85% to 95% of the current month's total residential electricity sales. To mitigate the impact of nominal price inflation on the retired population, Termoelectrica has set a "Social Tariff" for up to 50 Kwh of electricity per month at price of approximately 3 cents/Kwh. The average residential electricity bill is 82 Kwh per month, which is not significantly above the maximum feasible consumption of a household on the Social Tariff. Termoelectrica management estimates that approximately 37% of households choose the Social Tariff. The average monthly pension in Romania is estimated to be 800,000 lei, which converts to $49 at an exchange rate of 16,400 lei/$. Consequently, approximately 3% of the average monthly pension is necessary to pay for 50 Kwh of electricity at the Social Tariff rate. Even at a subsidized rate and for a small quantity of energy, electricity expenditures are a noticeable fraction of a typical retiree's monthly income. Both the average price paid and total quantity of electricity consumed increases for households not on the Social Tariff, so that electricity expenditures are a noticeable fraction of monthly income for other households in the lower tail of the income distribution.

Significant governmental pressure to restructure and privatize CONEL can be traced to its substantial foreign debt obligations of $673 million. Of this total debt obligation, $135 million was issued privately to the former national electricity company, RENEL, by Merrill-Lynch with the provision that the terms of the loan can be re-negotiated if RENEL ceases to be "the principal generator and distributor of electricity in the Republic of Romania." The re-structuring of the RENEL into CONEL in July of 1988 caused this option to be exercised, which resulted in the Ministry of Industry and Trade signing a guarantee to make payments on the loan to prevent re-negotiation of the terms of the loan. Further changes in the structure of CONEL contain the risk that

Merrill-Lynch may demand re-structuring of these bonds obligations to reflect the increased default risk.

A final aspect of the RESI that complicates the restructuring process is the distinction between public state-owned assets and private state-owned assets. The bulk transmission grid in Romania is an example of a public state-owned asset. This means that although CONEL maintains and operates the bulk transmission grid, it does not in fact own the transmission grid, so it is unclear if it can recover depreciation expenses associated with the bulk transmission grid in its tariffs. On the other hand, generation assets and the local distribution grid are private state-owned assets. CONEL owns these assets and is allowed to recover a reasonable depreciation charge associated with these assets as a business expense. The value of these assets and the associated rate of depreciation allowed is determined by the Ministry of Finance. As a result of the very rapid rate of price inflation in Romania, these assets have been re-valued several times by the Ministry of Finance, with the most recent re-valuation taking place in June of 1999.

3. Current Re-structuring Process in Romanian Electricity Supply Industry

RENEL, the Romania Electricity Authority was established by Government Decision No. 1199 in 1990 and is the successor to the Ministry of Electricity. RENEL was a state-owned "regie autonome," with electricity and heat supply being its primary activities. As shown in Table 3, RENEL accounted for virtually all electricity and approximately half the thermal energy produced in Romania. RENEL was divided into five groups. Group for Electricity and Heat Generation (GPEET) had 26 coal-fired generation branches and 10 hydroelectric plant generation branches. Group for Electricity Distribution and Transmission (GTDEE) had 42 local distribution agencies, of which 18 also operated transmission facilities, including a number of small hydroelectric generating units. Group for Nuclear Energy (GEN) operated the Cernavoda nuclear facility, the heavy water production facility, the nuclear fuel production plant, and two nuclear research institutes–Group for Studies and Engineering Research (GSCI) and Group for Development and Rehabilitation (GDR).

The electricity industry re-structuring process in Romania began as of June 30,1998 with Government Decision No. 365. This process is broadly consistent with the European Union directives. Government Decision No. 365 separated RENEL, into the National Electricity Company, S.A. – CONEL a state-owned, commercial corporate entity which performs the tasks of transmission, system and market operator and owns 100% of the shares in three affiliates: (1) S.C. Termoelectrica, S.A., the thermal electricity generation and thermal heat production provider; (2) S.C. Hidroelectrica, S.A., the hydroelectric generation provider, and (3) S.C. Electrica, S.A., the power distribution and supply company. The nuclear operations were separated into the state-owned commercial company S.N. Nuclearelectrica, S.A., which is operates all nuclear facilities in Romania. The Regie Automone for Nuclear Activities (RAAN) was formed to take over heavy water production for nuclear facilities.

The former GPEET was split up and distributed to these new entities. S.C. Termoelectrica took over 24 thermoelectric generation branches. S.C. Hidroelectrica took over the ten hydroelectric

generation branches. RAAN tool over the thermoelectric generation plant, Halanga, which is connected to the Romag Drobeta heavy water production plant. The 42 local distribution branches of the former GTDEE were taken over by S.C. Electrica. CONEL took over all eight branches of the transmission network, five of which also manage the national electricity dispatch process. In addition to thermoelectric capacity, Termoelectrica also operates 106 MW of capacity in micro hydroelectric facilities. The transmission network is comprised of 220, 440 and 750 kilovolt lines, with a total length of 8,150 kilometers and 69 transformer stations.

The National Electricity and Heat Regulatory Authority (ANRE) was established through Emergency Ordinance No. 29 in October of 1998 and enhanced through The Electrical and Thermal Energy Law, Emergency Ordinance No. 63 later than year. ANRE became operational in March 1, 1999. It is charged with creating and implementing a national electricity and heat regulatory structure to manage the transition to a competitive electricity market consistent with, among other requirements, the EU directives. It has the power to enact regulations on the behavior of market participants, penalize market participants for any breach of their contractual obligations, and to arbitrate the disputes among sector participants. As of September 1999, ANRE had two regulatory departments–Licenses and Technical Regulations Department and Trade Settlement and Tariffs Department.

ANRE issues licenses and authorizations for generators and energy service providers. It also writes the general technical requirements for generators and loads to connect to the grid, metering requirements for each market participants, and performance standards for energy and ancillary services provision. ANRE is also charged with specifying commercial regulations for each market participant. This has been interpreted by the current President of ANRE, Dr. Jean Constantinescu, as specifying the mechanism for compensating generators for the energy and ancillary services they provide to the system operator. ANRE is also charged with setting the prices and tariffs for all monopoly activities with the consent of the Office of Competition. Any disagreements between the Office of Competition, the regulated entity and ANRE must be settled by the Government's Cabinet of Ministers.

The current President of ANRE has a plan for setting the contractual obligations for generating facilities to supply energy and ancillary services to the system operator and for the establishment of a real-time spot market for the supply of electricity beyond these contractual obligations. The wholesale market will have two components: (1) a regulated trade arrangements market with power purchase aggrement contracts between incumbent producers and suppliers for 90% of total electricity consumption, and (2) a competitive market for negotiated bilateral contracts with eligible customers for up to 10% of total consumption. There are also plans to develop a day-ahead spot market. ANRE plans a gradual process to increase the share of the competitive market, with an initial share of the spot market on the order of 1-2% of total consumption, functioning primarily as a balancing market. Transmission and system operation will remain monopoly activities.

The amount of metering and information technology infrastructure currently in the Romanian transmission and distribution grid will make it very difficult to operate a real-time spot market for

even a small amount of electricity without very significant up-front investments and a time delay sufficient to implement this new technology. Implementing such a scheme would require real-time metering technology throughout the transmission grid to verify whether or not generators and loads actually honored their spot market obligations in real-time. A sophisticated settlement software is necessary to determine the hourly amounts paid to each market participants for fulfilling their real-time obligations and collected from each major load serving entity for their real-time electricity consumption. In addition, this settlement mechanism must give all market participants very strong incentives to honor their commitments in real-time because the amount of electricity supplied to the grid must equal the amount consumed at each instant in time.

The operation of the electricity spot market proposed by the President of ANRE would also require the construction of bidding protocols and market-making software, as well as the ability of all generation-owning and load-serving entities to communicate with the system operator in real-time in order to translate commitments won in the spot market into the physical supply and consumption of electricity as rapidly as possible. In this regard, it is useful to note that the start-up costs associated with establishing the California electricity market was $250 million. Start-up costs for the establishment of a competitive electricity market in Romania should be lower because of its smaller geographic area and significantly lower peak electricity demand. However, significantly more up-to-date metering and information technology existed in the California transmission grid at the time of the transition to competition than what currently exists in the Romanian transmission grid. In addition, much of the costs of establishing a competitive electricity supply industry are independent of the size of the market. Consequently, a very conservative estimate of the start-up costs of putting in place the necessary metering equipment, information technology, and market-making and settlement software to establish an electricity spot market is on the order of $100-$50 million. Given the initial conditions in the Romanian electricity supply industry, it is difficult to see how immediately setting up such a spot market will produce the gains in economic efficiency sufficient to justisfy this very large up-front investment.

It is important to emphasize that putting in place any sort of bid-based real-time or near-real-time market for energy and/or ancillary services, no matter how small, will still require a significant fraction of these up-front costs. For example, an imbalance energy market where generators and loads buy and sell energy to make up deviations from their day-ahead or long-term contractual obligations will require similar levels of start-up costs. Even if less than 5% of all energy consumed will be traded in this market, significant start-up costs must still be incurred. Real-time metering technology is necessary to monitor real-time consumption and production of energy for compliance with the independent system operator's (ISO's) dispatch instructions. Market-making software is needed to take bids to supply imbalance energy from available generating units in real-time in order to set the price imbalance energy during each time interval. Settlement software will also be necessary to determine payments and charges to generators and load-serving entities for their purchase and sales of real-time deviations from their contractual obligations. Price-based or non-price-based mechanisms must be in place to allocate in real-time scarce transmission capacity to generators wishing to supply more or less energy or load-serving entities wishing to consume more or less energy. Finally, the balance between electricity supply and demand must be maintained at all times and the ISO must carry sufficient reserve capacity to respond to unforseen contingencies

within the bulk transmission grid and unexpected generating unit outages. The only way to avoid these up-front costs is not to establish a real-time spot market for energy.

The initial conditions in the Romanian electricity supply industry differ in many important dimensions from those in the electricity supply industries of other countries around the world at the time they began the restructuring process. As a general rule, in all of these countries, the price of retail electricity was thought to be high as a result of prices set to recover the embedded cost of poor past investment decisions made by the government-owned monopoly supplier. Inefficiencies in the dispatch process were also thought to increase the price of retail electricity further. Policymakers felt that privatization and the introduction of competition would impose market discipline on the investment behavior of the electricity generation sector. The prevailing view was that political concerns such as energy independence, support for a domestic coal industry, or promotion of renewable energy sources had led to these very costly investment decisions in the past. Given the growing demand for electricity in these countries, providing clear economic signals for new investment in generating capacity was an important policy goal. A major concern expressed in a 1981 study by the United Kingdom Monopolies and Mergers Commission (MMC) was that the pre-privatization market structure did not provide the proper signals for constructing the optimal amount and type of new generation capacity in a timely manner (Armstrong, Cowan and Vickers, 1994, p. 291). In California, a traditionally high-price electricity state, the promise of lower prices for all consumers was the major impetus for the state's recent re-structuring efforts. These high electricity prices are also thought by many observers to be the direct result of past poor investment decisions by the state's regulated utilities.

In all countries, competition to supply electricity from existing plants was seen as way to provide strong incentives for minimum cost operation of existing facilities. Consequently, restructuring efforts in all developed countries were aimed at reducing the retail price of electricity and stimulating the appropriate technology mix and quantity of new investment in generating capacity. Romania, in contrast, faces what appears to be, from the discussion in Section 2, very low delivered prices for electricity and tremendous excess generating capacity. Consequently, many of the reasons for introducing any sort of spot market for electricity (day-ahead, hour-ahead or real-time) are not as relevant to Romania as they were for the other countries of the world that have restructured their ESI. Nevertheless, as we discuss in Section 5, there are many benefits from privatization and a selective introduction of competition in the RESI that can lead to substantial benefits to Romanian consumers without establishing a spot market for electricity as it exists in the US, Western Europe, and Asia-Pacific region. This strategy avoids the significant up-front costs of a spot market, but does not give up the opportunity to capture a large fraction of the potential benefits from privatization and the introduction of competition in the RESI.

> **Recommendation 1: Given the current state of the Romanian economy and electricity supply industry, the establishing a real-time or day-ahead spot market for electricity should be a low priority relative to other less costly approaches to introducing competition into Romanian electricity supply industry.**

The management of CONEL has a plan for making the transition to a more competitive electricity market in Romania. They would like to implement a single buyer scheme for procuring electricity from the generation units owned by Termoelectrica, Hidroelectrica and the other independent power producers for the next 6 months. The major restructuring effort during this time will focus on consolidating the 42 distribution companies into between 8 and 14 geographically distinct distribution and supply companies. Because of pressing foreign debt obligations discussed above, there is an budgetary urgency to privatize several of these new distribution companies as soon as possible. Two regions have been selected as the most likely candidates for privatization–Timisoara on the far west of Romania and Constanta on the far east. ANRE has issued regulations in line with Emergency Ordinance 63 establishing regulated third-party access to the bulk transmission grid and plans to privatize the regional distribution companies under this form of access.

Even this goal of consolidating the 42 distributional companies will require significant commitment by CONEL and the Romanian government. The potential benefits from such a consolidation are unclear. Currently, each of the 42 regional distribution and supply companies has its own local management structure. The process of combining these entities will require deciding which of these local positions will be eliminated when several local distribution companies are combined into a larger entity. Private buyers should be better able to decide the most efficient combination of these 42 distribution companies. In addition, the process of forming financially viable independent distribution companies will also require breaking down the current average retail price of $42/MWh into components that results in prices for distribution and retail supply that allows the resulting local distribution and supply companies to be financially viable. As of February 2000, ANRE has established distinct tariffs for generation, transmission, ancillary services, distribution and retailing. For generation the prices set are: (1) Termoelectrica (36.5 $/MWh), Hidroelectrica (7 $/MWh), Nuclearelectrica (26.8 $/MWh) and for independent producers (36.5 $/MWh). The tariffs for other services are: (1) distribution (8 $/MWh), transmission (3.2 $/MWh), retail (2 $/MWh), and for ancillary services (2 $/MWh). All prices were based on methodologies drawn up by ANRE in consultation with CONEL, consumer groups, national employer and labor unions, and interested state authorities.

A vertically integrated monopoly supplier must only be concerned with covering the total cost of supplying electricity to all electricity customers. Consequently, setting separate prices for transmission, distribution, supply and wholesale electricity has been largely unnecessary. Under the current structure, Electrica, the distribution company bills and collects for the electricity that it sells. From this revenue, it pays all of its operating expenses, and then distributes the remaining net revenue to CONEL to pay for operating the system and the transmission grid as well to pay the generators in Termoelectrica and Hidroelectrica for producing electricity. Termoelectrica receives payments for its sales of thermal heat to municipal heat distribution companies for the remainder of its revenues. A necessary condition for making the local distribution companies financially viable is a mechanism for compensating the combined distribution and supply companies for the services they provide. This will require setting a wholesale price for electricity, a price for transmission services, and a price local distribution services, as well as a component for the supply of electricity.

The primary difficulty in setting a single wholesale price of electricity, to which is added separate transmission, distribution and supply charges, is that different generating facilities are paid different prices under the current regime. According to staff at CONEL, the average wholesale revenue paid to electricity generating facilities is roughly $28/MWh. However, different generating technologies are paid different prices for producing electricity. Hydroelectric energy is paid $7/MWh and nuclear $13/MWh. Fossil-fuel facilities receive an average revenue of approximately $44/MWh. This average revenue is paid to thermal facilities because they also produce heat and it generally agreed that thermal heat production is priced below its average incremental cost. An additional reason for higher payments to thermal facilities is because of the domestic coal and lignite consumption requirements necessary to maintain the viability of the domestic coal and lignite industry. This differential pricing of electricity depending on how it is produced creates a significant barrier to establishing a single wholesale price of electricity given the current separation between hydroelectric, nuclear and fossil facilities. Unless the cross-subsidy between thermal heat and electricity prices and the implicit subsidies to domestic coal and lignite consumption are eliminated, paying a single price to all electricity generated within a given hour will dramatically increase the total cost of supplying electricity, because hydro and nuclear energy will have to be paid the same rate as thermal energy during all times that some thermal sources are necessary to serve demand. In addition, the constraint to operate many high-cost thermal units to supply minimum levels of heat creates an additional difficulty with paying a single price for wholesale electricity. There may be time when these thermal units are not required to provide electricity but must operate at minimum levels to provide heat. During these times, it makes no economic sense to pay all generators the variable cost of the highest cost thermal facility operating, because an unconstrained electricity system would not operate these high cost heat production facilities.

According to managers at CONEL, the average cost per MWh of distribution and supply is between $10/MWh and $12/MWh. The average cost of transmission is $4/MWh and there is an additional $4/MWh Development Tax imposed. This Development Tax goes into a fund that is used to finance new investments by CONEL. This yields a total transmission, distribution and supply cost of approximately $20/MWh, which is consistent with our conservative estimate of this magnitude used in Section 2 to show the underpricing of retail electricity in Romania.

A final difficultly with the current re-structuring process is the lack of credibility caused by the current regulatory process. The regulatory agency and its responsibilities were established under Emergency Orders issued by the Cabinet of Ministers. Although Emergency Orders are in force from the time they are issued, they do not become law until they are approved by both houses of the Parliament. They can also be can be rejected or modified during this process. Consequently, if any entity believes that the political winds are likely to shift, there is an incentive to delay implementing the secondary legislation (written by the regulator) describing how the industry will operate. One can also imagine that any potential private investor in the Romanian ESI will demand a risk premium or simply be unwilling to purchase until the emergency order is approved by both houses of the Parliament in its final form. The experience described above of RENEL and the Romanian government with international companies providing loans to the former RENEL demonstrates that these concerns are in fact real and can impose significant costs on RESI and government.

Even if these Emergency Orders are approved in their present form there is still a problem with the credibility of the current regulatory process because any disputes between CONEL, ANRE, and the Office of Competition must be settled by the Cabinet of Ministers, which is likely to make the regulatory price-setting process highly politicized. The high rate of domestic price inflation and the tremendous political pressure to reduce the rate of increase in the retail price of electricity and heat to final residential and industrial consumers makes this outcome even more likely. There is ample evidence that the government will be unable to resist the temptation not to carry out its promises in this regard. For example, several provisions were written into the recent electricity industry restructuring law in order increase CONEL's ability to repay its international loans. The government agreed to increase the average retail price of electricity to $50/MWh and to exempt from the Value-Added Tax (VAT) and other import taxes all equipment used to modernize generating facilities. However, the government honored neither of these provisions, and more recently there is pressure to further reduce the $/MWh average retail price of electricity, rather than increase it.

Table 7 provides further evidence of the difficulty the Romanian government has in maintaining established electricity and heat prices during very high rates of inflation. The first two columns under the Electricity and Heating headings give the established average retail price approved by the Ministry of Industry jointly with Office of Competition in Romanian Lei and US dollars, respectively. The third column under each heading is the actual average dollar price received by RENEL over the time period for which the established price was valid. The first column of the table gives the time interval each established price was valid. There are two reasons for the actual average price to be less than the established price. First, is that actual inflation during the period the retail price was valid is more rapid than anticipated. Second, the Ministry of Industry delays the implementation of the approved rate increase so that the average revenues collected by RENEL during that time period are insufficient to achieve the established average revenue level. Both of these outcomes lead to an under-recovery of revenues by the RESI.

4. Requirements for a Successful Electricity Industry Restructuring Process in Romania

Successful privatization and restructuring of an infrastructure industry requires a clearly articulated ultimate goal for the process and a detailed plan of action for attaining this goal. This section will first discuss the costs and benefits of electricity industry restructuring in Romania. This discussion motivates Section 5 which characterizes of the essential features of the regulatory process necessary for a successful restructuring of the RESI.

The ultimate goal of the current Romanian electricity industry restructuring process appears to be consistent with European Union directives and the development of a privately-owned competitive electricity supply industry in Romania. However, the major challenge is how to get to this end point with the least amount of distortion to Romanian economy. Different countries around the world have started this process from different initial conditions. Most countries began in the government-owned, monopoly supplier regime. England and Wales, Australia, New Zealand, Norway and Sweden, and Spain, the developed countries furthest along in this process, all began from the government-owned monopoly regime. Among the developed world, the United States is unique in starting electricity industry restructuring from a regime with many privately-owned

regional monopolies. As result, there a many willing and able competitors to any of the regional monopolies that are also regional monopolies in other parts of the US. There are also merchant power producers operating throughout the US that construct and operate plants purely to serve wholesale electricity demand. In addition, because of the long history of the privately-owned regional monopoly market structure, in most US states a regulatory price-setting process has been in place for close to 100 years. Currently, every state in the United States has a public utilities commission which regulates retail electricity supply. In addition, the Federal Energy Regulatory Commission regulates wholesale electricity for the entire country. Both because of the availability of numerous competitors to the incumbent monopoly and the long history of economic regulation throughout the industry, US restructuring process is unique even when compared to the countries listed above, all which had little history of economic regulation and few nearby competitors to the incumbent monopolist.

Because the Romanian electricity supply industry is a government-owned monopoly, one might think that the restructuring process in Romania should be patterned after those in England and Wales, Australia, New Zealand, Norway and Sweden and Spain. However, Romania differs from these countries in two ways which considerably complicates any restructuring process. First, all of these countries have developed economies with long-standing political and legal regimes. Despite the limited experience of these countries with economic regulation of privately-owned firms, the legal and institutional framework necessary to establish a credible regulatory process has existed for a very long time. Second, the citizens and businesses of these countries have had considerable experience with prices determined through market mechanisms. Both of these characteristics of the Romanian economy argue in favor of a more gradual transition to the privately-owned, multiple supplier regime than occurred in the countries described above.

Recommendation 2: Given the initial conditions in the Romania economy and RESI, the transition to the privately-owned, multiple supplier regime in RESI should be gradual to ensure that a stable, credible and transparent regulatory regime is established to manage the restructuring process.

The necessity of establishing a credible and transparent regulatory regime that is perceived as fair to both the firms in the industry as well as final consumers, argues for an extended period of time when all aspects of the industry are regulated. This regulatory regime must also establish that electricity prices will be set to cover going-forward production costs and that all electricity bills will be paid in a timely manner. If the regulatory process does not have these features, the Romanian government will find it extremely difficult to attract domestic and foreign investors when it decides to sell of the assets of the electricity supply industry.

4.1 Costs of Current Government-Owned Monopoly Supplier Regime

Before deciding to begin a restructuring process, a determination should be made of whether the costs associated with the transition outweigh the ultimate benefits expected from this process. This determination will also provide valuable input into the design of a restructuring process that best serves the long-term interest of Romania. Initial conditions in the Romanian electricity supply

industry are particularly favorable to restructuring. Sufficient generation and transmission capacity is available to serve Romania's electricity demand for at least the next 5 years under the most favorable assumptions about the rate of economic recovery. Because of the very energy-intensive nature of Romanian industry during the Communist regime, as shown in Section 2, there is a considerable amount of generation capacity in excess of the current peak system demand.

According to the CONEL management, congestion in the bulk transmission grid is extremely infrequent given these reduced levels of demand. Developing countries attempting to restructure their electricity industry typically face a looming shortage of generation capacity which implies an urgent need to attract foreign capital for new plant construction. Clearly, this is not the case for Romania. However, foreign capital is still necessary to assist in the Romania restructuring process. Foreign capital is most needed to repair and modernize existing generation and transmission facilities throughout Romania. Under its former status as RENEL, the national electricity company received foreign funding from the International Bank for Reconstruction and Development (IBRD) and the European Bank for Reconstruction and Development (EBRD) to support rehabilitation and modernization of its generation, transmission and distribution facilities. However, if several aspects of the current operation of the Romanian electricity industry can be appropriately modified, even an influx of foreign capital for this purpose may be unnecessary.

Most of the economic problems faced by the Romania electricity supply industry can be traced to its government-owned status. This is the major cost of continuing with the current market structure. There is a large academic literature documenting the incentive problems associated with government ownership of infrastructure industries (see Vickers and Yarrow, 1988). Some are unique to developing countries, but others are common to government ownership in general. For example, a recent U.S. Congressional Budget Office study (CBO, 1997) noted the following four incentives for inefficient provision of electricity associated with government ownership:

1) Separation between revenues and costs
2) Reduced cost of capital to governement-owned businesses
3) No independent oversight of rates
4) Inadequate maintenance of facilities

All four of these problems appear in the Romanian electricity supply industry.

Separation between revenues and costs means that the revenues from the sales of electricity accrue to the government, whereas the costs of production are appropriated as part of the budgetary process. In contrast, a privately-owned firm must earn revenues that at least cover its production costs or it will be unable to attract the capital necessary to undertake investment to maintain or expand its plant and equipment. More generally, this separation between revenues and costs implies that a government-owned electricity industry can be used as a source of funds for the government almost indefinitely. The government's failure to honor several provisions that were written into the recent electricity industry restructuring law in order increase CONEL's ability to repay its international loans described in Section 2 is an example of this phenomenon.

Reduced cost of capital to government-owned businesses implies that other factors besides economics determine whether or not investments are made by a government owned entity. Political factors can and do play a major role in type of technology employed, the timing and size of new construction. This is certainly the case in Romania where the government has recently approved continued funding for Unit 2 of the Cernavoda nuclear power plant and continued financing for heavy water production despite the very large amount of excess electricity generating capacity in Romania.

No independent oversight of rates implies that the government has considerable freedom in using electricity prices to pursue non-economic ends, because it has no requirement to cover production costs and a market-determined rate-of-return on the initial investment with the electricity prices set. In particular, the government can set electricity prices sufficiently low to attract electricity intensive industries to certain locations. For example, in the Pacific Northwest of the US, large government-owned hydroelectricity facilities producing very low-priced electricity resulted in the location of a number of electricity intensive industries nearby. Romania faced a similar problem because industrial customers are usually thought to be the lowest-cost customers to serve. However, in Romania they have traditionally paid significantly higher electricity prices so that RENEL could provide electricity and heat to residential customers at reduced rates.

Inadequate maintenance of facilities means that relative to privately-owned electricity generation facilities, the government-owned facilities spent considerably less on maintenance than did investor-owned facilities. For example, over the ten-year period from 1986 to 1996, US investor-owned utilities averaged maintenance expenditures that were approximately 7.2 percent of their revenues from electricity sales, whereas the federal government-owned facilities averaged maintenance expenditures that were approximately 4.5 percent of their revenues from electricity sales. These relatively lower maintenance expenditures led to a lower operating efficiency for the federal government-owned facilities. The CBO report compared the ratio of production to operable generating capacity for federal government and non-federal government hydropower producers from 1991 to 1995. For the year 1995, this ratio for all federal capacity was 38.7%, whereas the average for non-federal capacity was 51.4%. The US government appears to be better able to find funds for new construction rather than for undertaking the level of maintenance necessary for efficient operation of their existing facilities. In light of its decision to continue construction on Cernavoda Unit 2 given the pressing need for updating much of CONEL's existing generation and transmission facilities, the Romanian government appears to have the same desire favor new construction over the level of maintenance expenditures necessary efficient operation of existing facilities. Given this tremendous amount of excess generating capacity in the Romanian electricity supply industry, this bias towards new construction rather than maintenance expenditures is particularly costly.

Romania faces one final problem with government ownership that plagues infrastructure industries in most developing countries. Customers do not pay their bills on time, or sometimes at all. This arrears problem is particularly acute for CONEL's sales of wholesale steam for domestic heat. A number of industrial customers of electricity and heat have been and continue to be unable to pay their bills in a timely manner. As the economy begins to improve more firms are beginning to pay a portion of their arrears in addition to their current bill. Given the low levels of disposable

income, particularly among the elderly population, and the rapidly increasing nominal prices of electricity and heat due to the high levels of domestic price inflation, it is understandable why consumers are unable to pay their electricity and heat bills. However, electricity and heat continues to flow to these customers.

> **Recommendation 3: CONEL should be able to disconnect industrial customers who do not pay their bills. Residential customers unable to pay at current prices should be offered subsidized rates that are financed either from general governmental revenues or through higher prices paid by CONEL's sales of electricity to other customers.**

All US state regulatory bodies require the utilities they regulate to offer "lifeline" electricity rates to low-income customers for their essential electricity needs. These rates are typically financed by slightly higher rates to other customers served by these utilities. Qualification for these lifeline rates is need-based. Customer on these rates are usually subject to a maximum monthly consumption. CONEL's current "Social Tariff" is a lifeline rate. CONEL should implement more formal means testing of households in order to reduce the fraction on the Social Tariff to those who truly cannot afford to pay the unsubsidized price.

4.2 The Benefits of Privatization and a Gradual Introduction of Competition

Privatization of the existing government-owned, monopoly supplier has the potential to eliminate many of the incentives for inefficient operation described above. However, crucial to a successful privatization are several initial conditions in the industry. By privatizing too early, the Romanian government will be selling off valuable assets at an extremely low price. For example, selling off the assets of an industry where a substantial number of customers do not pay their bills on time or at all, will not fetch the same price as one where the ANRE has put in a place a mechanism for providing explicit subsidies to those households unable to pay their electricity bills because of financial hardship.

By selling off the electricity supply industry without a well-formulated and credible plan for industry restructuring, the government may be putting in place a market structure that is not in the long-term interest of Romanian consumers. For instance, one way to increase the sale price of government-owned assets is to allow a market structure where the resulting privately-owned firms can set very high prices and therefore earn monopoly profits. Prospective buyers will be willing pay high prices for these assets, but Romanian consumers will subsequently pay for these very high sales prices in the form of higher electricity prices than is necessary due to the exercise of market power by the resulting privately-owned firms. A privately-owned monopoly regime will eliminate the explicit exercise of market power, because the regulatory process and not the market will set retail electricity prices. However, a large privately-owned monopolist will instead attempt to raise prices through the regulatory price-setting process or its management may attempt to collect rents through inefficient production. This possibility argues in favor of establishing a credible and independent regulatory body early on in the restructuring process.

If this regulatory body is not perceived by both the Romanian government and potential investors as independent and balancing the long-term interests of consumers and the electricity supply industry, either or both of two things can happen. It may be very difficult to sell the electricity supply industry's assets at a reasonable (from the government's perspective) price because potential investors fear the Romanian government may attempt to lower electricity prices if the new owners manage to reduce costs and increase profits during the post-privatization regime. On the other hand, if the regulator is unable to set prices that reflect the actual costs of the privatized firm because of pressure from either the government or the privatized industry, the resulting electricity prices paid by Romanian consumers may higher than necessary.

If the transition to a competitive market proceeds without a credible and independent regulatory body executing a coherent long-term plan for the structure of the industry, excessive market power may arise in the market ultimately created. For example, in the United Kingdom the rush to privatizate the former government monopoly, National Power, lead to adoption of a market price-setting process that was a slight modification of the dispatch algorithm used by the former government monopoly (Alex Henney, 1999). This rush to privatize produced an industry with considerable market power that has persisted for almost 10 years. The impetus for the reforms currently underway in the UK electricity industry can be traced to the defects in the initial market design. By rushing the transition to a multiple-supplier competitive regime, the Romanian government faces substantial risk of selling its electricity industry assets at very low prices in order to create a restructured industry that sets high prices of electricity for Romanian consumers. As is increasing clear from the experience of virtually all electricity industry restructuring processes in the US and abroad, market power due to a poor initial market design is the major hurdle that must be cleared in order for final consumers to receive the full benefits of wholesale and retail electricity competition.

Perhaps the strongest argument in favor of a gradual transition is to a competitive market is Romania's recent history as a Communist country. The experience of other developed countries that have privatized and introduced competitive electricity markets–the UK, Australia, New Zealand, Norway and Sweden, and many regions throughout the US–is that the initial market structure and market rules require substantial changes to achieve the desired outcome of the restructuring process. For example, in the UK a significant amount of generating plant owned by the two companies formed from the original government monopoly has been sold off to third parties since the wholesale electricity market began operation. In New Zealand the original government monopoly has been divested into an ever larger number of firms over time. In Australia and many regions of the US–California, New England and PJM (Pennsylvania, New Jersey, Maryland, Delaware, and Washington, D.C.), there have been many rounds of market rules changes since wholesale competition was introduced. The administrative processes required to make market structure and market rules charges are extremely time-consuming and financially burdensome to the parties involved. In addition, because these market structure and market rule changes are usually attempting to mitigate the exercise of market power, they involve decisions which reduce the amount of economic rents going to some market participants. The formal and informal attempts by the affected parties to avoid the loss of their economic rents puts significant stress on the enabling legislation and regulatory processes that underlie these administrative procedures. Consequently, these processes

often end up in a judicial review of the regulatory body's initial decision. For example, in the US some of the market rule changes implemented in the newly formed regional wholesale electricity market are the subject of litigation. This aspect of the process of introducing a competitive wholesale market makes it essential that the government have in place a well-defined process for implementing changes in the market structure and market rules. Given that Romania is currently in the initial stages of democracy, it may be too much to ask for it to implement immediately the legal procedures and regulatory structures that have evolved over many years in the long-standing democracies of the world.

Another issue that argues in favor of a gradual transition is the very large fixed cost associated with setting up a wholesale electricity market. Setting up a market with hourly or half-hourly prices requires, at a minimum, all generation supply points and load take-out points in the bulk transmission grid to have metering technology that will allow the production and consumption of electricity at all of the these points to be measured on an hourly or half-hourly basis . Market-making software must be designed and put in place to run, at a minimum, a day-ahead market for energy, a market for transmission capacity, and a real-time market for energy. There must be an extremely robust communications infrastructure in place for the market participants to communicate with the independent system operator (ISO) of the electricity grid so that commitments made through the market-making process are implemented in the transmission grid as rapidly as possible. Settlement software must also be written to compile all of the information recorded at the various meters throughout the grid, in order to determine the amount paid to generators for the services that they provide and the amounts owed by loads for the electricity they consume during each time interval. The software also needs to take into account any time period-level (hour or half-hour) transmission charges that are the result of congestion in the bulk transmission grid. An extremely sophisticated and expensive software system must be put in place. For this reason, the costs associated with starting-up a wholesale spot market are extremely large. As discussed in Section 3, the start-up costs associated with the current California wholesale market structure is $250 million, which serves a peak electricity demand of approximately 45,000 MW and population of approximately 30 million. These start-up costs are higher than those for markets in other regions of the United States, because of the necessity of forming a single control area from the three control areas managed by the original three investor-owned utilities–Pacific Gas and Electric, Southern California Edison and San Diego Gas and Electric. US regional markets in PJM area and the New England area were formed out of pre-existing tight power pools, so the start-up costs were lower, but still significant. Their history as a tight power pools composed of vertically-integrated regional monopolies, considerably reduced by the legal and institutional costs associated with forming a wholesale market in these areas. For reasons discussed in Sections 5 and 6, the Romanian government may wish to pursue this sort of gradual transition to a competitive wholesale market.

An important lesson from all competitive electricity markets around the world is that generators and loads will pursue their own financial interest often to the detriment of system reliability. Market participants must therefore be provided with financial incentives to maintain rather than reduce system reliability. However, the ability to provide these financial incentives is limited by the ability of the ISO to monitor the real-time output of each generating unit and the real-time consumption of each load point. Consequently, the type of power flow monitoring technology

in both the bulk transmission grid and at the generating stations and load take-out points imposes technological constraints on the sorts of price signals that can be provided to market participants. It is also important to emphasize that in all competitive electricity markets currently operating there are often significant differences between physical flows in the bulk transmission grid and those determined by the real-time electricity market-making process. If market participants profit from differences between physical and financial flows of electricity, then these differences are likely to persist until the market rules are changed to provide financial incentives for the physical flows to match the financial flows as closely as possible.

A simple example of this phenomenon occurs if existing meters only make it possible to measure a generator's daily electricity output. In this case, it is impossible to verify if that generator is following instructions given by the system operator or honoring its contractual obligations on an hourly basis. Therefore it makes little sense to attempt to set prices at a finer interval of time than a day, if meters are read on a daily basis.. Deviations from hourly contracted quantities within the day cannot be determined from a daily meter reading, if the total amount of energy supplied in the day is equal to the sum of the 24 hourly contract quantities. However, when this energy is supplied during the day can exert a tremendous influence on system reliability and the demand for automatic generation control and other ancillary services.

Attempting to run a wholesale electricity market even for a small fraction of total energy consumption using only daily price signals would be virtually impossible without a significant amount of generating capacity excluded from this market and used by the ISO to maintain the minute-by-minute balance between supply and demand in the electricity grid. The ISO must have sufficient number of price signals to provide the incentives for generators and loads to maintain the real-time balance between the supply and demand for electricity necessary for reliable grid operation. Consequently, as the competition to supply electricity is move closed to real time, more sophisticated grid monitoring and market-making and settlement software is necessary to operate this market. This more sophisticated technology is also very expensive, so that clear benefits should apparent before introducing more of this sort of competition into the market. This tradeoff between technological sophistication of the transmission and distribution grid and the degree of spot market competition that it can support is a very important factor to be considered in the Romanian electricity supply industry restructuring process. Many of the benefits of privatization and a competition can be achieved without having to pay for significant amounts of this technological sophistication. Bilateral or multilateral contractual supply relationships between generators and retail suppliers for a large fraction of the total electricity consumption is still possible without the sophisticated market-making, metering, congestion management and setttlement technology necessary to run a day-ahead or real-time spot market for even small fraction of total electricity consumption.

5. Staging the Transition to a Competitive Market

This section will describe the optimal sequencing of the transition to a privately-owned competitive electricity market. Because the key to the success of this transition process is a stable regulatory process which balances the competing interests of the industry participants and Romanian consumers, this section also describes the essential features of this regulatory process.

Although the factors mentioned in the previous section argue in favor of a gradual transition to privatization and the introduction of competition into the Romanian electricity supply, the evidence to date around the world show clear benefits from electricity industry restructuring, particularly from privatization of former government-owned industries. Even in the UK, which is sometimes held out an example of an unsuccessful industry restructuring, average real retail electricity prices have declined 26% since restructuring took place in 1990 (UK Electricity Association, 1999). However, the major benefit from restructuring in the UK is the tremendous improvement in productive efficiency. The UK electricity industry has continued to serve a growing amount of electricity demand with a significantly smaller labor force.

The first goal of the Romania electricity industry restructuring process should be to create an initial industry structure that is conducive to a successful restructuring process. This requires an industry structure and regulatory process that sets electricity prices which result in the highest possible value for Romania's generation, transmission and distribution assets that is consistent with the ultimate goal of restructured electricity industry with robust competition for the generation and supply of electricity. Although a wholesale spot market for all Romanian electricity is the ultimate goal of the restructuring process, it may be extremely difficult to justify on a cost/benefit basis for a very long time, if at all, given the current state of the Romanian economy and ESI.

5.1 Establish the Regulatory Process Early On

An essential feature of any successful restructuring process is an independent regulatory body that is able to regulate prices and service quality for the entities that result, and make the necessary market rule changes along the way to adapt the industry to changing market conditions.

> **Recommendation 4: The regulatory body should be permanently established as early as possible in the restructuring process. It should be at least be permanently established along with the legislation that initiates the industry restructuring process.**

Each step of the restructuring process creates vested-interests, which can make further change extremely difficult to implement. By introducing the regulatory agency early on, the powerful vested interests which can significantly slow the restructuring process and introduce unnecessary market inefficiencies can be managed from the start. A regulatory body established at the beginning of the process also serves the role of an impartial recorder of the history of the restructuring process. This source of impartial information about the early stages of the process can become extremely valuable later in the restructuring process. Any inappropriate behavior by a market participant during the transition process can be noted and dealt with at a later time.

Romania has attempted to establish a regulatory body before it embarked on its electricity industry restructuring process. ANRE (National Electricity and Heat Regulatory Authority) was established through Emergency Ordinance 29 and enhanced in Emergency Ordinance 63, and became operational on March 1, 1999. However, as noted above, Emergency Ordinances are subject to review and approval by the Parliament before they become binding law. This aspect of the

enabling legislation undermines the credibly of ANRE, because the current or a future Parliament could significantly alter or even abolish ANRE. Consequently, the first order of business to begin the restructuring process is to establish ANRE as a permanent legal entity. Without a credible regulatory body in place, it is extremely difficult to solve the regulatory commitment problem necessary begin the process of privatization and eventual introduction of competition.

5.2 Nature of Commitment Problem in Regulatory Process

The regulatory process governing the restructuring process must trade off two competing goals. Specifically, it must have sufficient flexibility to adapt to the changing conditions in the industry, while at the same time having features which allow it to credibly commit to honoring previous commitments. The electricity industry requires extremely long-lived investments in generation, transmission and distribution assets. Privately-owned firms will not make the investments necessary for the long-term viability of the industry unless they believe that the regulator and government are willing to commit to allowing the firm the opportunity to earn a return on this investment commensurate with the level of risk it takes on. For example, if prospective investors feel that the regulatory environment is unstable, they are very unlikely to make investments that may be profitable under a more stable regulatory regime. They may also be willing to pay less for same asset under an unstable regulatory regime than a stable regulatory regime. For example, establishing the ANRE under an emergency ordinance builds instability into the regulatory process that reduces the value of CONEL generation, transmission and distribution assets to prospective investors.

There are variety of ways for the regulatory process to solve this commitment problem. For example, under the US regulatory process, firms are, by law, allowed the opportunity to recover their production costs as well as a "fair rate-of-return" on their current "used and useful" capital stock. Under the US regulatory process the firm's current "used and useful" capital stock is referred to as its ratebase. There are well-defined administrative processes for determining the regulated firm's ratebase as function of its past investments. All of the firm's investment decisions are subject to a "reasonableness or prudence review" by the regulatory body. This review determines whether these investment expenses were reasonable in light of the best forecast of future level of demand in the industry. If these investment expenditures are prudently incurred they then enter into the firms ratebase, and the firm is allowed the opportunity to earn the regulated rate of return on its ratebase in the current period so long as these assets remain "used and useful." This requirement means that the assets are actually used by the firm to produce its output and they are useful for this activity, meaning that it is reasonable to employ them in this manner given the current technology for electricity production. This commits future regulatory commissions to honor the investment decisions deemed prudent by previous regulatory commissions that are actually employed in the production process. The current regulatory body is charged with setting the "fair rate of return" on these investment expenditures. This rate of return must, by law, then be applied to the firm's ratebase which depends on all prudently incurred past and present investment expenditures currently used in production. Because the regulated rate of return must be applied to the entire ratebase in determining the firm's revenue requirements, the regulatory body commits to allowing the firm to earn this return on all previous used and useful investment expenditures. The US regulatory process is one example how to build commitment into the regulatory process.

Recommendation 5: The Romanian regulatory process should establish a ratebase value for all capital equipment owned or operated by CONEL, and the regulatory process should allow CONEL the opportunity to earn a "fair rate of return" on all "used and useful" capital stock.

It is important to emphasize that the ratebase value of a piece of capital equipment need not equal its historical cost or its replacement cost. Given the current state of RESI, much of its capital stock is neither used, nor is it useful, because of the current level of demand for electricity. These facts must be taken into account in setting a ratebase value for these assets.

5.3 Characteristics of Regulatory Process Necessary to Solve Commitment Problem

There are several rules governing the regulatory process which make solving this commitment problem much more straightforward. The first is a requirement of due process, that the regulatory process must be carried out according to some set of established rules and principles. One of the most important established principles is the respect for precedent, that the logic of past decisions will be respected in making future decisions unless there is significant evidence this logic was faulty. The US regulatory process has a long history of honoring precedence. Because of this, market participants can be confident in that past decisions will be respected and that future decisions will be made in a manner consistent with prior logic, unless there is significant evidence that the previous logic was flawed or inconsistent with current laws.

In order to determine if the prior logic is invalid, and that precedence should be given a lower weight, the regulatory body must have the ability to gather information from market participants. The regulator should therefore be able to compel market participants to provide the information it requires to make this determination. A minimum requirement in this regard is annual financial balance sheet information. The regulatory body should also be able to request and receive periodically other information it determines is necessary to a reach decision. It is important that that supplemental data requests be subject to a regulatory burden test. Compliance with the regulatory process should not be excessively burdensome to the firms involved, in the sense that the expected benefits associated with requiring the regulated entity to compile and submit data should be commensurate with the benefits expected to accrue to the regulatory process from having this information available.

The commitment problem may also be difficult for a regulatory body to solve because of the external pressures it faces from market participants or the government. This implies that the agency's budget should be determined independently of any actions it might take, and all of its decision-makers should be immune to influence by the government or market participants for a pre-determined terms of office. The requirement for a budget sufficient to accomplish its duties should be contained in enabling legislation to prevent the government from cutting the agency's budget in the future if makes decisions contrary to the government's wishes. Crucial to guaranteeing independence is the fact that the regulatory agency's budget cannot be affected by the current decisions that it makes and that the government cannot overturn the regulatory commission's decision except through legislative action or by judical review. For cases under judical review, the

law should give significant weight to the regulatory process, and only overturn a decision in those circumstances where due process was not followed or the resulting regulatory process is inconsistent with existing laws. Another way to reduce the opportunities for the government to compromise the independence of the regulatory body is to stagger the terms that members serve. For example, in the US, members of regulatory decision-making bodies are appointed to staggered finite terms in office so that regulatory body always has the same distribution of experienced and inexperienced members.

An additional way to ensure an independent process is to establish decision-making power within a committee or commission rather than with a single person. Although there are well-known problems with decision-making by committee, one of its advantages in the present context is its aversion to extreme changes in policy. For example, if members are appointed to 5-year staggered terms, then it unlikely that the sorts of decisions emerging from the regulatory body will dramatically change if one member of a 5-member committee is replaced. This also provides the opportunity to put restrictions on the composition of the regulatory body. For example, a majority of the members of the decisionmaking body cannot be members of the same political party.

The option for judicial review of decisions made by the regulatory body is particularly important, because another major requirement for solving the regulatory commitment problem is accountability of the regulatory body for the implications of its decisions. Endowing a regulatory body with the ability to set prices and service quality standards and to make market rule changes, gives it an enormous amount of discretion. Without an accompanying obligation to do this is in a responsible manner that respects the legal rights of all parties involved and the precedents that exist from previous decisions, there is considerable leeway for opportunistic behavior by the regulatory body. By requiring the regulatory body to be accountable, in the sense of providing market participants with the opportunity to request a judicial review of regulatory decisions, the likelihood that the regulatory body will implement policies which violate previous regulatory commitments will be limited. The enabling legislation for the regulatory body should therefore provide it with a mission statement and general guidelines for its operation. This enabling legislation then forms the legal foundation for any attempt to overturn or modify a decision made by a regulatory body through judicial review. The early experience of the US regulatory process is instructive in this regard. During the early stages of regulation of electric utilities, natural gas pipelines and other network industries, there were a large number of judicial reviews of decisions make by the newly created regulatory bodies. However, as a large body of legal precedent from these judicial reviews and from previous regulatory decisions developed, the number of major judicial reviews declined significantly.

A final aspect of the regulatory process that further increases its ability to balance the competing goals of honoring previous regulatory commitments against the flexibility to respond changing industry conditions is transparency. A regulatory process is transparent if there is a single entity which makes the final decision and there is a clear record of how this decision is arrived at. It is essential that the regulatory body have the right to make the final decision on pricing, service quality and market rule changes. A process where the regulatory body makes recommendations that must then be ultimately decided by another decision-making body, introduces unnecessary uncertainty into the regulatory process and creates additional incentives for market participants or the government to attempt to influence the regulatory process. The full responsibility for decision-

making should reside with a single entity, subject to the opportunity for judicial review of its decisions as discussed below.

Transparency has several dimensions. The first is that a written record of all information provided by market participants to the regulatory body must be provided to all other market participants. Next is that all decisions made by the regulatory body must be issued in written form and in light of the written evidence or oral evidence (that is subsequently transcribed) entered into the regulatory proceedings. These decisions must address the issues presented by market participants by weighting the relative merits of the arguments made for and against the decision under consideration. Because of the risk of judicial review, it is unacceptable for the regulatory body to disregard sound economic or legal analysis of an issue in favor a position with no explanation of the reasons for it. This is simply the due process requirement. The credibility of the regulatory body would also be severely undermined if market participant thought that it was possible to influence the regulatory outcome through secret meetings with members of the regulatory body or other non-public forms of interaction. For example, in the US many regulatory bodies prohibit non-public meetings between its members and staff and market participants that involve discussions of the details of issues currently under consideration by the regulatory body within a certain time period of the initiation of the formal decision-making process. This *ex parte* communication requirement increases the perceived transparency of the regulatory process, because market participants can be confident that from a certain time forward all information conveyed to the regulatory body relevant to the decision-making process must be made in a public forum. To ensure transparency ANRE issued in December of 1999, a document, *Procedural Norms to Issuing Regulations*, which requires public consultation and public meetings with all parties involved throughout regulatory process.

Another important aspect of an accountable and transparent regulatory process is open access to the proceedings. A very low standard should be applied to the process of determining whether or not an individual, firm or government agency is permitted to submit evidence to a regulatory proceeding. If an individual is sufficiently interested in the issue to the take the time to submit written evidence or an oral argument on an issue, then this level of interest should be sufficient to allow participation in the regulatory proceeding. The process of soliciting input from all interested parties is extremely valuable when the regulatory body is attempting to formulate a new policy to adapt to changing circumstances in the industry. For example, in many regulatory proceedings in the US and abroad, the regulatory body will post what is referred to as a notice of proposed rule-making (NOPR). This document will lay out the specific issues that the regulatory body plans to make a decision on and solicit input from all interested parties on how it should formulate these proposed rules for regulating the industry. Interveners will then file comments on the regulatory body's initial NOPR after some time lag. Then the regulatory body will analyze these comments and issue its final ruling. This decision addresses comments it has received on its NOPR and provides a foundation for the final decision which respects past legal precedence and regulatory decisions. This information gathering process is an essential aspect of the "due process" associated with any major regulatory decision. Strict adherence to this information solicitation and information processing function before in any major regulatory policy change limits the ability of a subsequent judicial review to overturn the regulatory body's initial decision for failure to adhere to the standards of due process.

Recommendation 6: The following eight essential characteristics of the regulatory process should be put in place as soon as possible:

***1. Legislation Defining Mission and Guiding Principles*: The enabling legislation should state the defining mission and guiding principles governing actions of regulatory body.**

***2, Respect for Precedent and Due Process*: Regulatory decisions should be made based on the maximum amount of information available following due process which respects the enabling legislation, existing legal precedent, previous decisions by the regulatory body.**

***3. Ability to Request and Receive Information*: Regulatory body should have the ability to request all information from market participants that is necessary for it to perform its functions so long as these requests for information can be justified as not being excessively burdensome to that market participant.**

***4. Open and Non-Discriminatory Process:* All interested parties should be allowed to participate in the regulatory process, although past a certain point in time the regulatory decision-making process all communication between the regulatory body and the market participants relating to the issue under consideration within the context of the formal regulatory proceeding. Regulatory process should favor no market participant or group of market participants.**

***5. Solicitation of Public Comment Before Major Policy Changes:* For all policy issues requiring changes in established principles of operation, the regulatory body should solicit public comment on proposed changes in how the regulatory body and industry should function.**

***6. Independence from Government and Industry:* Regulatory body should be provided with budget and permanent staff necessary to accomplish its duties. Members should be appointed to fixed terms. The recommend generic organizational structure would be a five-member committee appointed to staggered five year terms.**

***7. Single Decision making Body*: A regulatory body rather than a single individual should be the sole decision-making entity on issues relating to pricing, service quality standards and market rule changes for the industry.**

***8. Accountability Through Risk of Judicial Review of Decisions*: In exchange for sole decision-making authority, the regulatory body should be subject to judicial review based on violations of due process. However, the judicial review**

process should set a high standard for overturning decisions by the regulatory body.

6. Implementing Desired Regulatory Structure in Romania

A reading of the English translations of Emergency Ordinances 29 and 63 reveals that the regulatory process outlined in these documents has a several of the eight desirable characteristics mentioned above. However, based discussions with the CONEL staff, Ministry of Industry staff and other interested parties, the reality of how the regulatory process actually operates is quite different. Consequently, this section will first describe which of these features are written into the Emergency Orders. It then provides recommendations for integrating the remaining features into the regulatory process so that a privatization process which serves the long-term interests of Romania can be initiated as rapidly as possible.

The defining legislation for the ANRE states that its budget is to be collected from license and authorization granting tariffs. This is consistent with the goal of an independent ANRE. However, Emergency Order 29 also states that ANRE can collect penalties for non-compliance with market rules that are assessed on individual market participants. These penalties go to the Romanian government. Thus far ANRE has not levied a penalty. Although assessing penalties may enhance the efficiency of a stable, long-standing regulatory process, during the initial stages of a restructuring process, this may be counterproductive to establishing a credible, stable and transparent regulatory regime. This scheme immediately puts ANRE in an unnecessarily adversarial relationship with the entities it must regulate.

Recommendation 7: During the early stages of restructuring process the regulatory agency's budget should be set based on its expected duties and resources necessary to accomplish them.

Emergency Order 29 defines various duties for ANRE. However, it contains no defining mission and guiding principles for ANRE. For example, ANRE is given the authority to set tariffs for natural monopoly services, but it is given no guidance as to how these tariffs are to be determined. Specifically, there is no discussion of what constitutes a reasonable price. Emergency Order 63 attempts to solve this problem. Article 36 does describe what costs can be included in the prices set. However, it is extremely difficult to determine the empirical content of this article. Article 37 states that tariffs for electricity should be same for all captive customers all over the country. Article 38 requires that firms adhere to proper accounting principles. Article 39 sets out governing principles for the prices that result from the regulatory process. Article 40 requires that no cross-subsidies exist between the pricing of electrical and thermal energy. Consequently, Order 63 puts significant structure on the outcome of the regulatory price-setting process, although ARNE still appears to have considerable discretion in setting rates because many of terms used in various articles of Emergency Order 63 have no clear legal definition. Further clarification of all of these definitions is called for before they can be used in an actual regulatory proceeding. This is example of a set of issue where ANRE should issue a NOPR and solicit comment before arriving at a final decision in order to build consensus for what are sure to be very controversial decisions.

Article 6 of Order 29 contains an enormous list of responsibilities for ANRE, all of which can exert an enormous influence on the value of CONEL's generation, transmission and distribution assets. However, the order contains no discussion of the process ANRE should use to carry out its responsibilities. For example, there is no discussion of how precedent will be established and what constitutes due process in a regulatory proceeding. There appear to be no provisions which attempt to guarantee that if presented with same set of facts ANRE will produce the same decision, which is a minimal requirement of a transparent and credible regulatory process. Order 63 is largely silent on these issues as well. It provides very little guidance as to how decision-making will take place within ANRE. This is another example of a set issues where a NOPR would help to build consensus and avoid the risk of a decision being overturned by judicial review.

Article 14 of Order 29 requires that all market participants provide the information required for ANRE to perform its duties adequately. ANRE also has the ability to assess penalties for incorrect, incomplete and wrong information. Once again this ability to assess penalties seems contrary to the goal of establishing a stable and credible regulatory process. Article 14 is bound to create unnecessary tension between ANRE and market participants, with few accompanying benefits. Article 14 also does not specify any sort of cost/benefit criterion for data requests by ANRE. There is nothing to prevent ANRE from making an impossible-to-fulfill data request and then penalizing the market participant for failing to comply.

Although Order 63 does describe some features of the regulatory outcomes desired, there little discussion in it or Order 29 about how to ensure that the regulatory decision-making process is open and non-discriminatory. For instance, there appears to be no discussion of which entities can participate and under what conditions. The enabling ordinances are also silent on the necessity of soliciting public comment on proposed rule-making decisions. Given the large number of duties given in Article 6 of Order 29 and in Article 46 of Order 63 that must carried by the regulatory body and the complete lack of experience with economic regulation in Romania, the process could benefit considerably from a notice of proposed rule-making solicitation followed by an invitation to provide public comment, followed by final decision based on public comment. Particularly, during the early stages of the regulatory process, ANRE must attempt to build a consensus between it and all market participants concerning the direction of the restructuring process. For example, CONEL can be a very effective impediment to the restructuring process, and the incentives for it to slow the restructuring process are substantial. By allowing a significant amount of public comment early on in the process, a greater consensus for ANRE's proposed market rules can be built. It is important to bear in mind that successful regulation requires a tremendous amount of cooperation from the regulated firm. Clearly, the threat of financial penalties is one way to cause regulated firms to follow the instructions of the regulatory body. However, a far superior strategy that has worked very successfully in most all developing countries and particularly in the US, is to allow the regulated entity considerable input into the regulatory decision-making process.

The goal of regulation is to serve the greater interests of the citizens of the country or state in their role as consumers. Although the regulated firm will certainly disagree with regulatory decisions that adversely impact its financial interests, if they can be convinced that the decision

serves the best interests of consumers, they will be less likely to attempt to undermine the implementation of a regulatory decision.

> **Recommendation 8: Particularly during the early stages of the restructuring process, the regulatory body must be a consensus builder that oversees the operation of the firms it regulates, rather than an additional layer of managerial oversight for the day-to-day operation of the firms.**

There are far too many contingencies in the day-to-day operation of the firm that the regulatory body cannot anticipate, so it must instead my rely on the self-interest of the regulated firm to make the appropriate decisions when these contingencies occur. The firm's self-interest is more likely to be consistent with that of the regulatory body if it understands the logic underlying the regulatory decision and it feels that it has contributed significant input that has been accounted for in the final decision. The recently approved *Procedural Norms to Issuing Regulations* should help increase the perception among market participants that ANRE is a consensus builder.

Another shortcoming of Orders 29 and 63 is designation of the President of ANRE as the single decision-making entity, rather than a multi-person decision-making body. Many countries throughout the world have also established president-ruled regulatory authorities. However, for the reasons discussed below, particularly the early stages of the re-structuring process, a commission-ruled regulatory body seems preferable. Article 10 of Order 29 states that the President of ANRE should be assisted by a consulting council of 7 members, appointed by the Minister of Industry and Trade from proposals received from professional and consumer associations as well as experts from the Ministry of Industry and Trade. Article 9 implies that the President of ANRE is the sole decision-making entity. Discussions with, Dr. Jean Constantinescu, the current President of ANRE, confirmed that this was his understanding as well. ANRE has a staff and its own regulatory committee made up of the President, Vice-President and the heads of the two regulatory departments. The draft regulations are discussed in this committee before they are issued.

Decision-making by a committee gives the perception of a greater degree of autonomy from the government and the industry, relative to assigning decision-making power to single individual. There is a greater likelihood that market participants will perceive that a single individual is biased and unable to make impartial decisions. Based on discussions with market participants, this appears to be the case with the current President of ANRE. Several of the market participants and members of the Ministry of Trade felt that the current President of ANRE may not be impartial towards the current management of CONEL. Given the information made available to me, it is not possible to determine whether these perceptions are in fact true. However, these perceptions, even if they are false, undermine the effectiveness of the regulatory process and would be less likely to happen with a regulatory decision-making body supported by a permanent of staff of experts in their respective areas.

The regulatory process is far too complex for single individual or even a small number of individuals appointed to fixed terms to understand all of the details. There should instead be a permanent staff of experts at ANRE in power systems engineering, economics, and law to assist the

regulatory decision-making body. This staff would provide an institutional memory and expertise that is not possible in a regulatory process which relies very heavily on the President and members of the decision-making body appointed to fixed terms for all of its expertise and institutional memory. Having a permanent staff with an institutional memory also increases the likelihood the regulatory process will respect due process and precedence.

> **Recommendation 9: The regulatory body should have a permanent professional staff of lawyers, engineers and regulatory economists. Depending on their workload, members of the regulatory decision-making body may require their own self-appointed assistants to interact with the permanent staff of regulatory body.**

All successful regulatory bodies in the US at both state and federal level have the structure of a permanent staff of experts and decision-making body composed of elected or appointed commissioners serving fixed terms. This staff will have a strong interest in preserving the value of its expertise and will therefore be a strong force for respecting historical precedence and formal process. Members of the decision-making body often have a budget to hire a small staff, but the major administrative work of the regulatory body is done by the staff. Consequently, a superior strategy to the current decision-making structure of ANRE would be take four members of the consulting council and make them members of the decision-making body along with the President of ANRE. The remaining three members of the consulting council could then be made permanent staff and charged with hiring and managing permanent staff in the broad areas of power systems, legal institutions, and regulatory economics.

Article 6 of Order 29 notes that the tariff-setting methodology and resulting tariffs for regulated services will be subject to the approval of the Competition Office. This requirement is contrary to the goals of a successful regulatory process for a number of reasons. First, it opens up the price-setting process to external influences that will undermine its perceived independence. Based on discussions with relevant parties in Romania, it does not appear that the Competition Office has an explicit legal mandate to be independent of political or other external influences. For this reason, the Competition Office may be less likely to respect precedent and due process in the regulatory process. A very skeptical interpretation of Article 6 of Order 29 is that the traditional regulatory price-setting processes can be suspended if it becomes politically attractive to do so. A second argument against Article 6 is that it would require unnecessary duplication of engineering, legal and economic expertise relating to the electricity and heat industry on the staff of ANRE and on the staff of the Competition Council. Without the necessary expertise at both entities, the decision-making process at the entity with the inferior expertise will be perceived as less independent. This will attract more effort by interested parties to influence the regulatory outcome. A superior strategy is to concentrate this expertise in one agency, ANRE, and give all decision-making authority to that agency subject to the possibility for external judicial review.

Article 9 of Order 29 also states that decisions made by the President of ANRE may be appealed at the Bucharest Court of Appeals. The possibility of judicial review of ANRE decisions is essential to guarantee that ANRE is accountable for its decisions. However, Article 9 provides

no criterion for the court to use to evaluate whether or not an appeal has any merit. Examples of criterion would be whether the tariffs set by ANRE are not "just and reasonable" in the sense that they do not compensate the firm for a "fair rate of return on its used and useful past and present investments" commensurate with the level of risk borne by the firm. Another example would be whether a decision make by ANRE was consistent with due process in the sense that the decision was based only on the evidence presented in the regulatory hearing and not on private communications between ANRE and market participants. A final missing ingredient is a discussion of how the costs of such legal appeals processes are to be recovered by the regulated firm. For example, one scheme might require the loser to pay. Article 9 should be expanded to elaborate on the criteria to be used to determine if an appeal of a decision by ANRE has violated the intended goal of the regulatory process. By leaving these criteria vague, the possibility exists that any decision by ANRE could be appealed, which could render the regulatory process unworkable. If Order 29 contained specific goals for the regulatory process then Article 9 could be written to include a section which allowed appeals of decisions that were inconsistent with the stated goals of Order 29. Section 40 of Order 63 gives one example of a stated goal for the regulatory process. It prohibits cross-subsidization between the heat-producing and electricity producing activities of firms supplying these two products. However, both Orders 63 and 29 are silent on the guiding principles for determining the prices for regulated services or products. Article 36 of Order 63 notes that justified costs should be covered by the prices and tariffs. However, neither article provides a definition of justified costs, particularly what capital investments made by the regulated firm are included. Without a definition of justified costs and what is and is not included in this magnitude, the regulatory process will be unworkable.

6.1 Establishing Regulatory Credibility

Without a credible regulatory process the likelihood that the privatization process will yield the appropriate level of asset sales revenues to the government will be significantly reduced. If private investors, particularly those from abroad, perceive that the commitments made at the time the assets are sold will not be honored, they are unlikely to pay as much for the assets as they would otherwise. Consequently, before CONEL's assets are offered for sale, credibility of the regulatory process should be established to greatest extent possible.

There are two possible routes to regulatory credibility. The first is to begin the regulatory process as soon as possible with the entities to be sold still owned by the government. Then require the formation of separate corporatized entities with their own separate management and employees. Legal title to assets formerly owned by CONEL should be assigned to each entity. These entities should then be allowed the opportunity to earn the appropriate regulated rate-of-return on these assets. By operating in this manner and accumulating experience with the operation of the regulatory process, the Romania government, ANRE and the regulated entities can establish the credibility of the regulatory process and its ability to respond to changing conditions in the industry. In this case credibility, comes primarily from the demonstration effect of showing that the industry can function according to the rules set out by regulatory process without external government intervention.

The second route to establishing regulatory credibility can be employed jointly with the first approach. This entails making commitments to external entities that prevent future governments or regulatory bodies from not honoring previous commitments. For example, ANRE and the Romanian government could consent to have regulatory decisions periodically reviewed by an external oversight body for coherence with standard regulatory practice. The primary role of this oversight body would be to provide information to interested parties. It should have no explicit powers to overturn decisions. The Romanian government's desire to attract foreign investors and the resulting bad publicly from an unfavorable review by the oversight body is the mechanism that would lead to establishing regulatory credibility.

6.2 Necessity of Establishing the Bills will be Paid

Regulatory credibility also implies that customers must pay their bills in a timely manner. Uncertainty about whether payment will occur reduces the value that a prospective buyer places on the asset that provides the service. The Romanian government should therefore put in place programs that compel all customers to pay their bills for electricity and heat in a timely manner. For those who are unable to pay, the government may want to establish a program to provide the appropriate level of financial assistance to customers unable to pay their electricity and heating bills. All providers should have the right to stop service for non-payment. Private investors will be unwilling to purchase assets whose income streams are highly uncertain because customers have little or no incentive to pay their bills.

In this dimension, external entities such as the World Bank can provide strong incentives for bills to be paid. Conditioning future funding of World Bank loans or aid to the Romanian government on the levels of non-payment to the electricity and heat industries will provide strong incentives for the Romania government to determine which customers truly cannot pay and which can pay, and establish aid programs for the former and ensure payment by the latter.

For industrial and commercial customers this non-payment problem should solve itself under a private ownership structure. Those industries unable to pay will no longer receive service and will therefore exit the industry. However, the more serious problem concerns the residential customers who are unable to pay because they have fixed nominal incomes. The social tariff established by ANRE should be continued in some form even after the local distribution companies are privatized.

> **Recommendation 10: The local distribution companies should be privatized early in the process to provide strong incentives to solve the arrears problems. Privately-owned firms will feel less political pressure to continue to serve non-paying or delinquent customers. Government-owned entities are less credible in their appeals that non-payment impacts their own ability to remain in business than are privately-owned firms.**

6.3 Separate Prices for Each Service

The current re-organization of the RENEL into CONEL and the creation of separate subsidiaries owned by CONEL is a very important first step in the restructuring process. The next step in the process is financial separation between the various subsidiaries. This will require establishing separate prices for the final product sold by each company. For example, ANRE should establish a price paid for wholesale electricity provided by each company. Although the ultimate goal of this process is to establish a single wholesale price of electricity for the entire country, as discussed earlier, initial conditions in the industry prevent this from happening. Consequently, ANRE should first set a price for wholesale electricity supplied by Hidroelectrica, a price for wholesale electricity and a price for wholesale heat supplied by Termoelectrica, and a price for electricity supplied by Nuclearelectrica. ANRE should then set separate distribution and supply charges for each of the regional electricity companies. Economic logic dictates that distribution costs should vary with the geography and population density of the customers served. However, given the requirement of a single delivered price for all captive customers in Romania in Order 63, it may be necessary to set a single average distribution rate for the entire country. The costs of retail supply could also vary geographically, although the argument for this seems less clear.

Recommendation 11: ANRE should set the regulated prices for all individual services so that the retail price paid by each customer is equal to:

$$P(\text{retail}) = P(\text{wholesale}) + P(\text{Transmission \& System Operation}) + P(\text{Distribution}) + P(\text{supply})$$

where P(x) is the price of service x. Separate regulated prices for generation, transmission and grid operation, distribution and electricity supply is essential to begin the restructuring process.

This has been accomplished by ANRE in its tariff revision of February 2000. Potential purchasers of generation assets owned by Termoelectrica or Hidroelectrica must know the price that they will receive for electricity produced from these facilities as well as the regulatory mechanism that will be used to set these output prices. Similar logic applies to the prices that are set for grid operation and transmission services and the prices set for local distribution and electricity supply. The resulting retail electricity price will then be determined according to the equation given above. This equation allows sufficient flexibility to have different retail prices for different customers classes depending on the across-customer variation in any of the component prices. For example, the price in one region way be higher because the local distribution price is higher in that region. By setting separate prices for each component of the retail electricity price and requiring that each entity recover its going-forward production costs from sales at these prices will begin the process of establishing a credible and transparent regulatory process. Not until there is significant evidence that each of the newly formed firms is financially viable at the regulated prices set by ANRE should further steps in the restructuring process begin.

The significant financial hardship that the current retail price of electricity causes for a large number of Romanian consumers is a major challenge to setting separate prices for each service.

Consequently, to the extent that the sum of the initial service-specific regulated prices set by ANRE exceeds the current retail electricity price, a plan should be implemented to move all of these component prices up to their regulated level as rapidly as possible. In determining which prices to increase first, the top priority should be given to setting all prices to cover the variable operating costs and the going-forward fixed costs associated with providing each service for the current year. Because the Romanian electricity supply industry currently has a tremendous excess generating capacity it is important that the regulatory process does not set the wholesale price of electricity for power supplied by either Hidroelectrica or Termoelectrica equal to the embedded cost of either of these companies. These prices should be set equal to the going-forward cost of producing electricity. For example, in the case of fossil fuel generation, this would include all fuel costs, labor costs, any associated operation and maintenance costs, and any investment expenditures necessary to keep the plant operating in the current year. At the present time there is little need to attract new capital into the industry. Consequently, there is little reason to set wholesale electricity prices at a level necessary to attract new capacity into the market. It would only make sense to increase the regulated price above this level if there were a scarcity of generating capacity in the Romanian market and it was therefore necessary to attract more generating capacity into Romania.

Similar logic should be employed in the price-setting process of the other aspects of electricity supply process. The prices should be set to recover the variable costs of production plus any going forward fixed costs necessary to keep the capital stock operable in the current year. Prices set to recover higher levels of return to the capital will unnecessarily burden Romanian consumers during the initial stages of the transition process. Although there is not nearly as much excess capacity in the transmission and distribution sectors as there is in the generation sector, at the present time there is still little need for expansion of capacity in these sectors as well.

The pricing scheme described above separates the pricing of what are usually considered monopoly services–transmission, system operation and distribution–from what are usually considered potentially competitive services–generation and supply. This scheme will make it easier to introduce competition into the segments of the industry where it is considered feasible. As the transition to competition begins it may be necessary to raise the prices paid for monopoly services to attract new investment into these segments of the industry in order improve the efficiency of the competitive generation market. Credibility to honor commitments to pay for new investment could be handled through a rate base mechanism similar to the one described earlier. Under this scheme, all investment would be allowed to earn a “fair” rate of return throughout its useful economic life. At this time, the existing capital stock of each of the separate companies of CONEL could then be valued and put into the rate base of the firm that operates this capital equipment. For example, the transmission and system operation assets owned and operated by CONEL could be valued and put into the rate base of the firm that performs these functions. The regulatory process would then determine the price paid for transmission services and system operation by including an appropriate rate of return on this rate base. In this same way, the distribution company’s assets could be valued and placed in the rate base to determine its revenue requirements in the regulatory price-setting process. The prices that result from the regulatory process are likely to be higher than the current price of these services implied by the current retail electricity price and the average cost of producing wholesale electricity.

Given the need for repair of existing fossil fuel facilities described in the *S.C. Termoelectrica S.A. Annual Report 1998-1999* (CONEL-Termoelectrica, 1999), it is difficult to see how spending scarce government funds on the construction of new generation capacity is in the long-term interests of Romanian consumers. Consequently, the recent Romanian government decision to continue spending on the construction on Unit 2 of the Cernavoda Nuclear Power Station and the continued production of the heavy water necessary for it to begin operation (Nine O'Clock, January 28, 2000) does not seem to be in the long-term interest of Romanian consumers. Using these funds either in the form of subsidies to customers unable to pay their electricity bill or to rehabilitate existing generating, transmission and distribution facilities would further the goal of electricity industry restructuring, which should provide greater long-term benefits to Romanian consumers. If the construction of Unit 2 of the Cernavoda Nuclear Power Station is halted then it is also no longer necessary to continue operating the heavy water production facility, because the rate at which heavy water is consumed by Unit 1 of the Cernavoda Nuclear Power Station is orders of magnitude less than the rate at which heavy water is manufactured by the Romag facility.

7. Introducing Competition into the Romanian Electricity Supply Industry

Once the retail price for electricity has seen set equal to the sum of regulated component prices which recover the variable costs and going-forward fixed costs associated with providing each service, then it is possible to introduce competition into the RESI. However, before introducing competition it important to remember that competition creates very strong financial incentives to eliminate cross-subsidies in the provision of any set of services. Consequently, introducing competition before setting regulated prices that recover going-forward costs risks creating perverse incentives for new entry into the RESI. Competitors will enter into the markets for the services providing subsidies and eliminate the excess profits earned by these services. This process can have adverse impacts for the development of long-term competition in the RESI. Instead of focusing on investment that enhances the long-term efficiency of the industry, new entrants will focus on exploiting profitable arbitrage opportunities created by prices that do not reflect the current cost of providing each service.

Even in a competitive generation and supply regime where all prices are set to cover the going-forward costs of supply for each component of the delivered price of electricity the possibility of cross-subsidies still exists. This occurs because competition also create opportunities for profitable niche markets. For example, suppose a single wholesale price of electricity is set for all customer classes. If it is less expensive to serve industrial customers relative to residential customers in a given geographical area, under a competitive generation regime entry will occur into the provision of wholesale electricity for industrial customers. Under the regulated monopoly regime entry into this profitable industrial market is prohibited by law. Consequently, the introduction of competition into both generation and supply can create the opportunity for these profitable niche markets to form. The outcome of this process is that the incumbent supply companies will be left with the least profitable customers that they must serve at regulated retail prices that may not allow them to recover their going-forward production costs.

By assigning the default provider obligation before introducing competition into generation and supply, these adverse impacts can be largely avoided.

Recommendation 12: ANRE should designate a mechanism for assigning the default provider obligation for each geographic area and a price-setting process for compensating this provider for the cost of serving default customers.

The default provider should then have the obligation to offer all customers this rate, although it and all other suppliers should have the opportunity to offer any other price schedules. It makes the most sense to assign the default provider obligation to the incumbent electricity supply company rather than force all customers to switch to another supplier. So long as a default provider rate is established for all customers classes, it makes little sense to delay the introduction of retail competition to specific customer classes as has been done in other markets around the world. The best way to ensure the likelihood of success of wholesale and retail competition is the allow the largest number of opportunities for firms to compete for customers. Sequencing the introduction of retail competition by the size of a customer's peak electricity demand can diminish the opportunities for new entrants in retail supply to aggregate loads across diverse customer classes and become more effective competitors for the incumbent distribution companies. It important to emphasize that no customer is required to accept the default provider rate. This option is only required to exist as protection against the potential exercise of retail electricity market power.

Once a default provider has been identified and a default rate set for all competitive services and customer classes, then it is feasible to begin the process of introducing competition into wholesale generation and retail supply segments of the industry. The ultimate goal of this process is a spot market for electricity where all generating unit owners compete to supply all electricity demanded during each hour of the day. However, as discussed earlier, this requires an extremely sophisticated information system for collecting data about the performance of the transmission grid and for operating the various markets for electricity and ancillary services. In addition, given the tremendous amount of excess generating capacity available in Romania it is doubtful that there will be any new plant constructed to enter the wholesale energy market. There should, however, be very vigorous competition between existing owners of generating capacity and any new owners who purchase capacity owned by the Termoelectrica and Hidroelectrica to supply electricity to final customers.

Coincident with the introduction of competition into the wholesale and retail sides of the electricity market, the government should begin the process of selling off generating assets. The only limitation is that CONEL should retain control of a sufficient amount of generating assets to operate the transmission grid and manage the system in real time. ANRE has prohibited CONEL from owning any generation capacity. However, existing regulations given CONEL the ability to purchase ancillary services, including energy for grid operation from generators. Under this scheme, CONEL would contract with a set of generating unit owners to manage system reliability–both geographically and in real-time for the entire system.

For a given geographical area, the prices charges by all entities for retail supply of electricity must include the regulated distribution and transmission and system operation price relevant for that area. Because the price of generation and the price of supply are competitively determined there no upper or lower bounds on what suppliers can charge for these services. Each supplier must pay the regulated transmission and system operation and distribution charge on all kWh it delivers to final customers.

With this level of wholesale competition, Romania should be able satisfy the market-opening requirements of the European Union. Whether it wants to make the large up-front investments necessary to establish a spot market for electricity is something that can be addressed once this point in the restructuring process is reached. However, it is doubtful that given the current state of information technology in the Romanian transmission grid and system operation function, it is unclear if this next step of restructuring can be justified on a costs versus benefits basis.

At this time the Romanian government may also wish to consider selling off the separate distribution companies. The benefits from private versus government ownership in this portion of the industry depends on the regulatory process used to set prices. Given the current state of many of the electricity distribution and heat distribution networks in Romania, there is a tremendous need for investment expenditures to improve their efficiency. Consequently, it is unadvisable to implement a price-cap or other incentive regulation plan for these firms given the incentives to degrade quality that exists in a price-setting process that does not explicitly set output prices to allow recovery of a rate of return on all used and useful investments, particularly maintenance and new capacity expenditures. On the other hand a cost-of-service regulatory process which gives the opportunity to earn a rate-of-return on all used and useful investment expenditures has the well-known problem of encouraging over-investment. However, given the reduced maintenance and new capacity investment expenditures over the past ten years due to the slowdown in the Romanian economy, this sort of regulatory process coupled with private ownership of distribution network assets may lead to the necessary improvements in local distribution networks. Consequently, the major issue to be confronted in deciding whether to privatize the local distribution companies is the extent to which the necessary network repairs, upgrades and expansions will take place more rapidly and at lower cost under private ownership versus public ownership. The evidence from other countries, particularly the US, suggests that cost-of-service regulated firms have very strong incentives to undertake these expenditures in a lower cost manner than do government-owned distribution companies.

7. 1 Consolidation of Regional Electricity Companies May Not Be Necessary

Although it is doubtful that there should be 42 local distribution companies in Romania, there is also considerable uncertainty about the optimal number of distribution companies. In addition, there are also very uncertain gains to consolidation that may make it more costly in the long run to attempt to combine these companies before selling them off to private investors. It is difficult to see where the economies to scale are in operating a local distribution network. Consequently, a superior strategy may instead be to keep the number of companies in their present form and instead allow private investors to purchase one or a collection of these companies in the privatization process.

This will allow private investors, rather than ANRE or the Romanian government to determine which combinations of the original 42 regional companies make the most sense from an economic perspective. There many auction mechanisms available for selling off bundles of assets that could be used determine the optimal number of local distribution companies . In the US, a simultaneous auction mechanism was used to sell geographic bundles of electromagnetic spectrum. This process allowed each bidder to determine which combinations of geographic spectrum would best serve its needs as a provider of wireless telecommunications services. Similar benefits could be realized by using this sort of mechanism to sell of the 42 local distribution companies.

8. Conclusion

As general rule, privatization and the introduction of competition should be attempted only where there is a significant likelihood of long-term benefits relative to the status quo. The accumulated evidence from the electricity supply industries of other countries around the world is that privatization and the introduction of competition has the potential to yield significant benefits to Romania. However, the initial conditions in the electricity supply industry in Romania and the regulatory process currently in place, present a unique challenge to the design of the appropriate regulatory process for managing this transition. Establishing a credible regulatory mechanism that is perceived as responsive to all parties involved in the industry is crucial to a successful transition to privatized industry with robust competition in generation and supply. This report has outlined this necessary features of such a regulatory process given these initial conditions. It has then outlined the process of privatizing the industry and introducing competition in a manner consistent with the European Union directives.

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Table 1: CONEL Electricity Sales to Main Sectors of the Economy (in GWh)			
Sector	1997	1998	Difference
Industry:			
Iron and steel	4,338	4.042	(296)
Extractive	4,649	3,928	(721)
Chemical and allied industries	4,946	3,802	(1,144)
Energy and Water	2,260	2,237	(23)
Engineering	2,135	2,070	(65)
Non-ferrous metals	3,478	2,451	(1,027)
Foodstuffs	1,300	1,247	(53)
Vehicles	1,133	1,124	(9)
Textiles and Clothing	761	709	(52)
Paper and Paper Processing	533	411	(122)
Rubber and Plastics	369	310	(59)
Wood and Furniture	729	650	(79)
Other	2,382	3,340	958
Total Industry	29,013	26,321	(2,692)
Construction	307	293	(14)
Services Sector:			
Transportation	2,200	1,974	(226)
Trade	770	848	78
Public Administration and Social Services	792	773	(19)
Hotels, Restaurants and Theaters	345	357	12
Communications	204	216	12
Banking and Insurance	51	63	12
Other Services	471	506	35
Total Services Sector	4,833	4,737	(110)
Agriculture	1,078	1,114	36
Households	7,816	7,858	42
Public Lighting	7,816	7,858	28
Total Sales to Customers	43,397	40.701	(2,696)

Source: National Electricity Company, Consolidated Financial Statements prepared in accordance with international accounting standards.

Table 2: Average Revenue by Customer Class and by State in $/MWh in 1998					
State/Region	All Sectors	Residential	Commerical	Industrial	Other
New England	100	115	98	77	141
Connecticut	103	119	100	76	142
Maine	97	129	105	64	253
Massachusetts	95	105	94	81	139
New Hampshire	118	137	116	93	136
Rhode Island	97	111	94	78	112
Vermont	99	117	101	71	162
Middle Atlantic	94	116	102	58	94
New Jersey	102	116	100	78	177
New York	107	137	117	50	88
Pennsylvania	77	97	81	56	119
East North Central	65	86	74	45	71
Illinois	75	98	78	51	68
Indiana	55	72	62	41	99
New England	72	88	79	51	114
Ohio	64	87	76	43	62
Wisconsin	54	72	59	38	73
West North Central	59	73	61	43	61
Iowa	62	85	68	41	65
Kansas	63	76	63	45	94
Minnesota	57	73	62	44	77
Missouri	61	71	60	44	61
Nebraska	52	65	54	36	52
North Dakota	58	65	60	45	44
South Dakota	63	73	66	45	42
South Atlantic	65	79	64	43	62
Delaware	69	92	71	47	132
District of Columbia	74	80	74	44	66
Florida	71	80	64	50	68
Georgia	64	77	70	43	85
Maryland	70	84	69	42	90
North Carolina	65	81	64	47	71
South Carolina	56	75	63	37	59
Virginia	59	75	56	38	50
West Virginia	51	63	55	38	91
East South Central	52	64	62	39	61
Alabama	55	70	66	40	75
Kentucky	42	57	52	30	47
Mississippi	59	70	65	42	82
Tennessee	56	63	64	46	83
West South Central	60	74	64	40	62
Arkansas	56	73	57	39	65
Louisiana	58	72	65	42	62
Oklahoma	55	66	57	37	49
Texas	61	76	66	40	64
Mountain	60	76	64	41	53
Arizona	74	87	78	51	48
Colorado	60	75	57	44	82
Idaho	40	53	43	28	49
Montana	51	67	60	35	77
Nevada	58	70	65	46	39
New Mexico	69	90	79	46	57
Utah	52	68	57	34	44
Wyoming	43	64	53	34	35
Pacific Contiguous	72	85	82	47	56
California	90	105	97	63	75
Oregon	47	59	50	31	52
Washington	40	50	48	26	36
Pacific Noncontiguous	109	129	109	90	140
Alaska	99	115	93	73	146
Hawaii	115	138	123	94	122
US Average	67.5	82.7	74.3	45	68

Source: Electric Sales and Revenue 1998, Energy Information Administration Report DOE/EIA-0540(98).

Table 3: CONEL Electricity Balance (in Gwh) 1996-1998			
Source/Sink **Gross Production:**	1996 RENEL	1997 RENEL	1998 First Half RENEL Second Half CONEL
Hydroelectric	15,684	17,422	18,798
Thermal	42,750	32,871	27,266
Nuclear	1,386	5,400	2,227
Total Gross Production	59,820	55,693	448,291
CONEL's own Consumption	6,943	6,174	4,934
Purchases from Other Romanian	110	124	3,288
Imports	2,242	1,038	1,181
Exports	1,433	817	715
Electricity Demand on CONEL network	53,796	49,864	47,111
Sold to Romanian Customers	46,684	43,095	39,546
Different Assignments	55	318	1,115
Total Electricity Supplied	46,739	43,413	40,701
Losses and Meter Variations	7,057	6,451	6,410
Electricity Demand on CONEL	53,796	49,864	47,111

Source: National Electricity Company, Consolidated Financial Statements prepared in accordance with international accounting standards.

Table 4: Installed Electricity Generating Capacity in MW as of December 31, 1998				
Type of Plant	Capacity Installed	Capacity not in use	Capacity in Use	Operational Capacity
Coal	8,304	2,370	5,934	4,994
Fuel oil	5,533	1,522	4,011	3,752
Hydroelectric	5,934	-	5,934	5,474
Nuclear	706	-	706	706
Total	20,447	3,892	16,585	14,926

Source: National Electricity Company, Consolidated Financial Statements prepared in accordance with international accounting standards.

Table 5: Average Capacity Utilization by Prime Mover 1996-1998			
Type of Plant	1998	1997	1996
Thermal	35.58	38.70	43.51
Hydroelectric	39.20	36.90	34.04
Nuclear	72.61	87.31	44.45
Total CONEL/RENEL	40.58	40.26	40.65

Source: National Electricity Company, Consolidated Financial Statements prepared in accordance with international accounting standards.

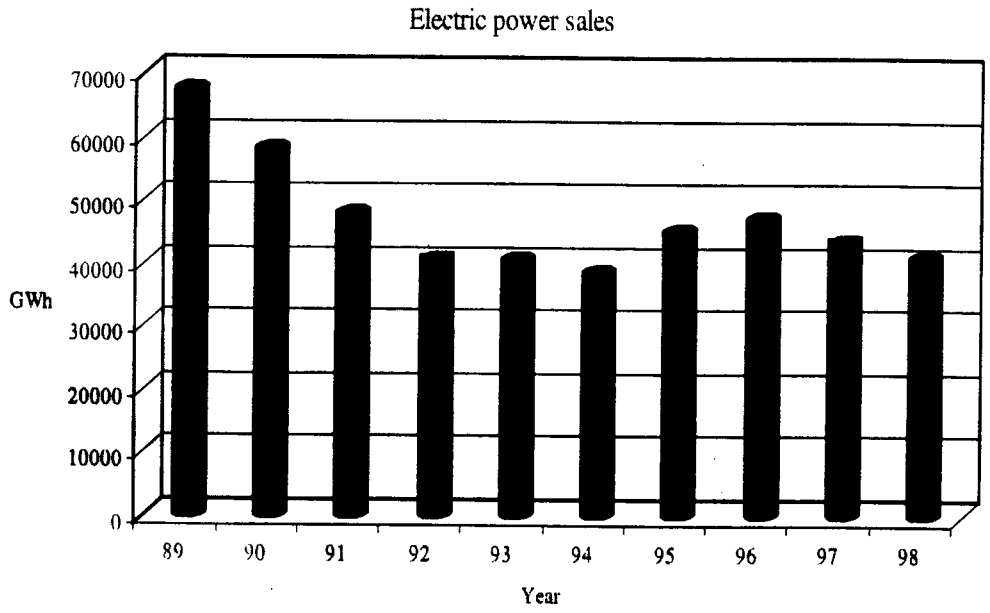
Table 6: Installed Heat Production Capacity in (Gcal/h) as of December 31, 1998				
	Hot Water		Steam	
Type of Plant	Capacity Installed	Operational Capacity	Capacity Installed	Operational Capacity
Coal	4,865	3,878	3,526	3,032
Fuel oil	14,158	10,021	4,551	3,600
Total	19,023	13,899	8,077	6,632

Source: National Electricity Company, Consolidated Financial Statements prepared in accordance with international accounting standards.

Table 7: Average Established and Actual Annual Price Valid for the Specific Time Periods						
	Electricity			Heating		
	Established		Actual	Established		Actual
Period	ROL/ MWh	USD/ MWh	USD/ MWh	ROL/ MWh	USD/ MWh	USD/ MWh
January 1 to July1, 1996	80,600	42.4	28.3	21,650	11.4	7.6
July 2 1996 to February 28, 1997	127,300	42.4	32.2	34,200	11.4	8.7
March 1, 1997 to April 30, 1997	365,000	50.0	50.0	80,600	11.0	11.3
May 1, 1997 to October 31, 1997	-	-	-	120,360	17.0	16.4
November 1, 1997 to May 10, 1998	385,075	50.0	47.2	127,620	16.6	15.7
May 11, 1998 to September 30, 1998	403,160	48.0	46.2	111,150	13.2	12.7
October 1, 1998 to February 14, 1999	403,160	44.8	38.5	119,266	13.2	11.4
February 14, 1999 to present	498,611	43.4	-	138,586	12.1	

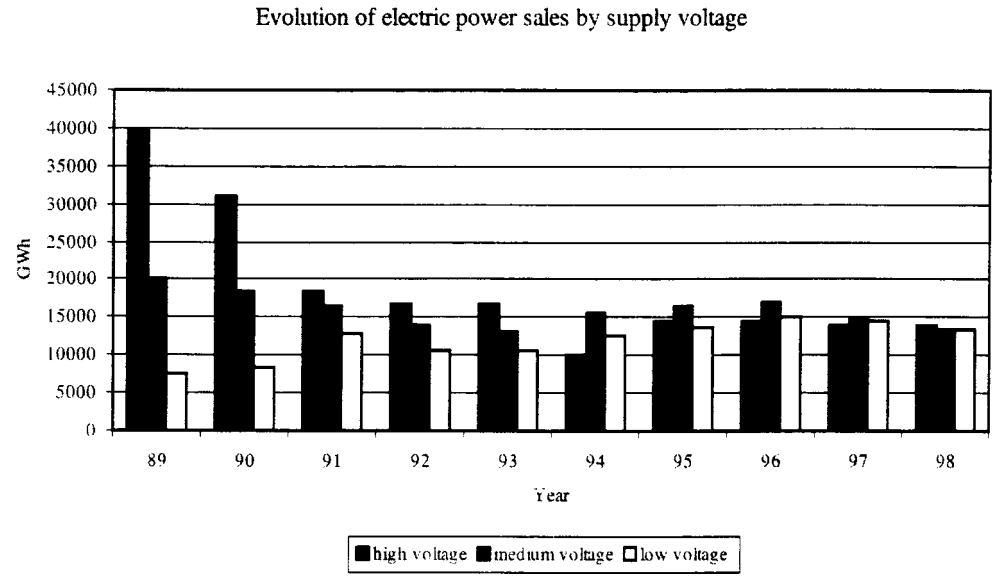
Source: National Electricity Company, Consolidated Financial Statements prepared in accordance with international accounting standards.

Figure 1: Annual Electricity Sales in GWh



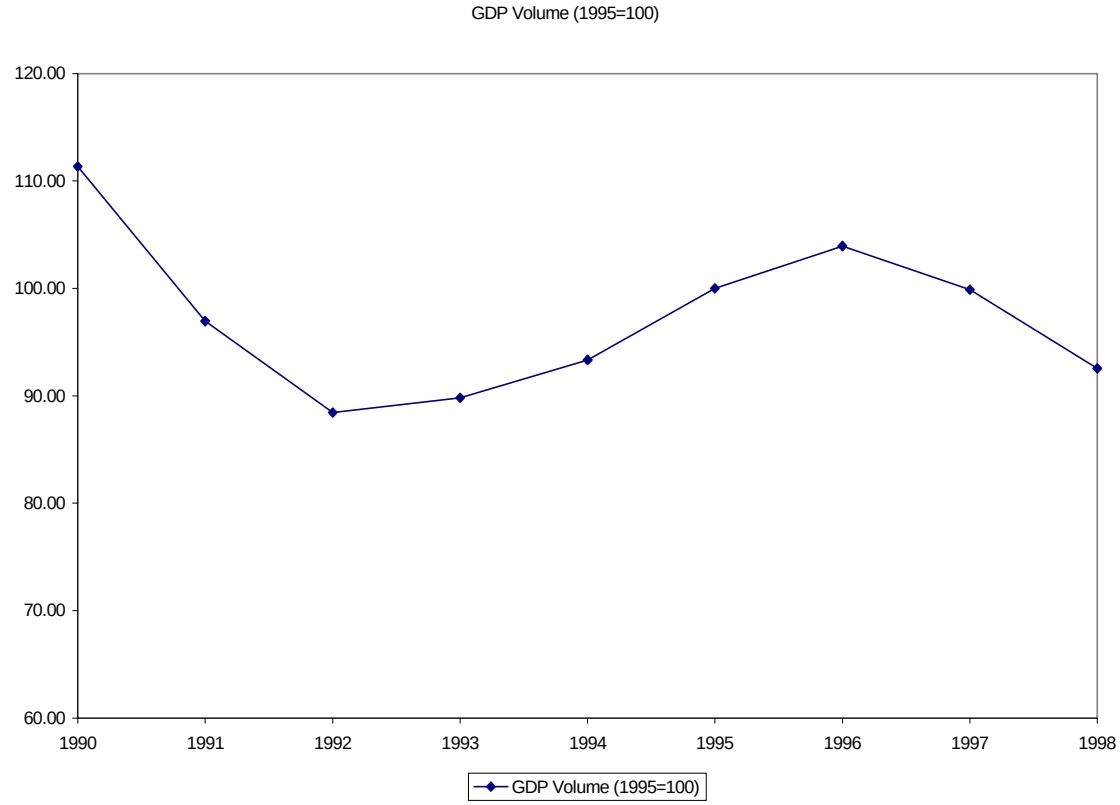
Source: CONEL (1999) page 25.

Figure 2: Distribution of Electricity Sales by Voltage Class



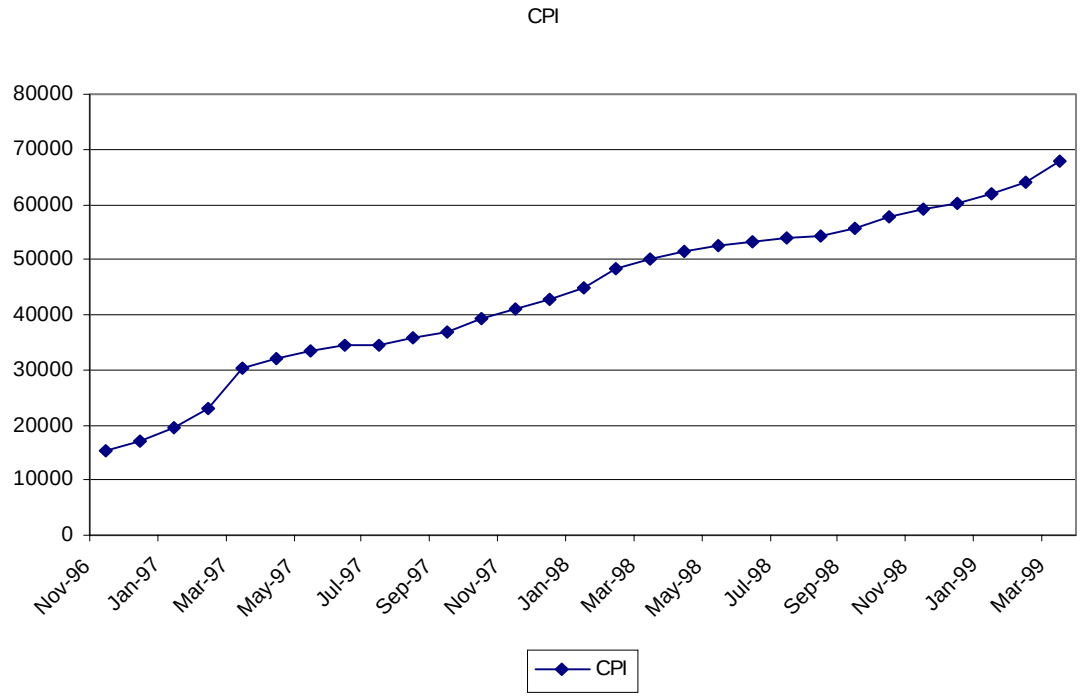
Source: CONEL (1999) page 25.

Figure 3: Index of Real GNP in Romanian Lei



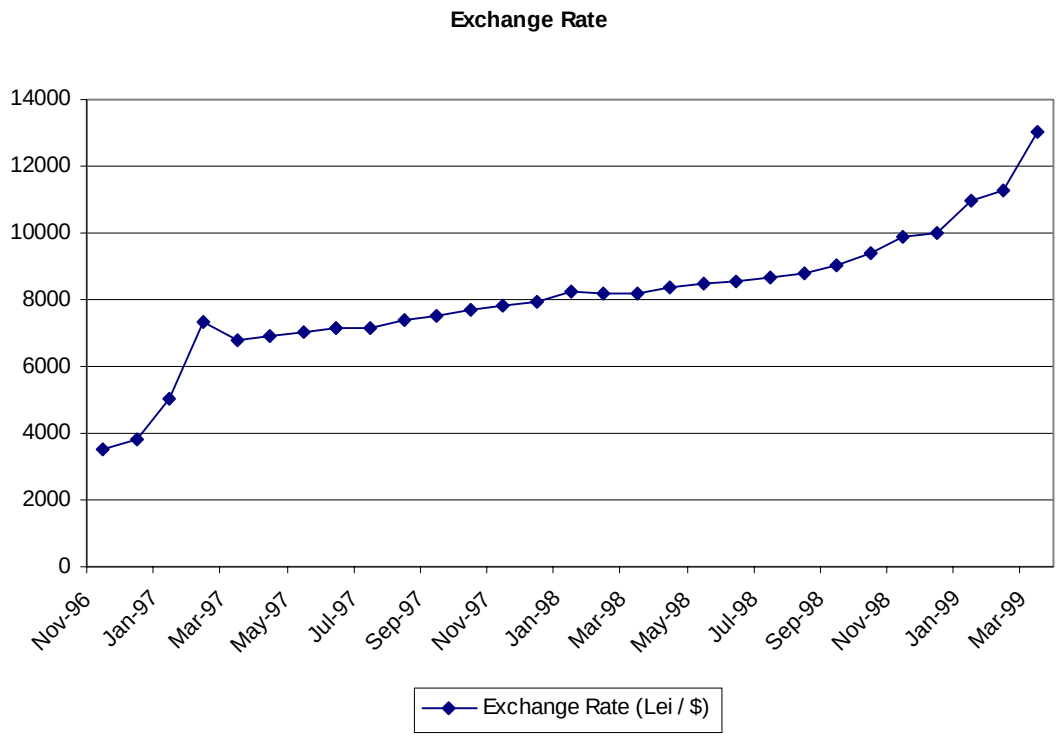
Source: International Monetary Fund (1999).

Figure 4: Month Consumer Price Index (October 1990=100)



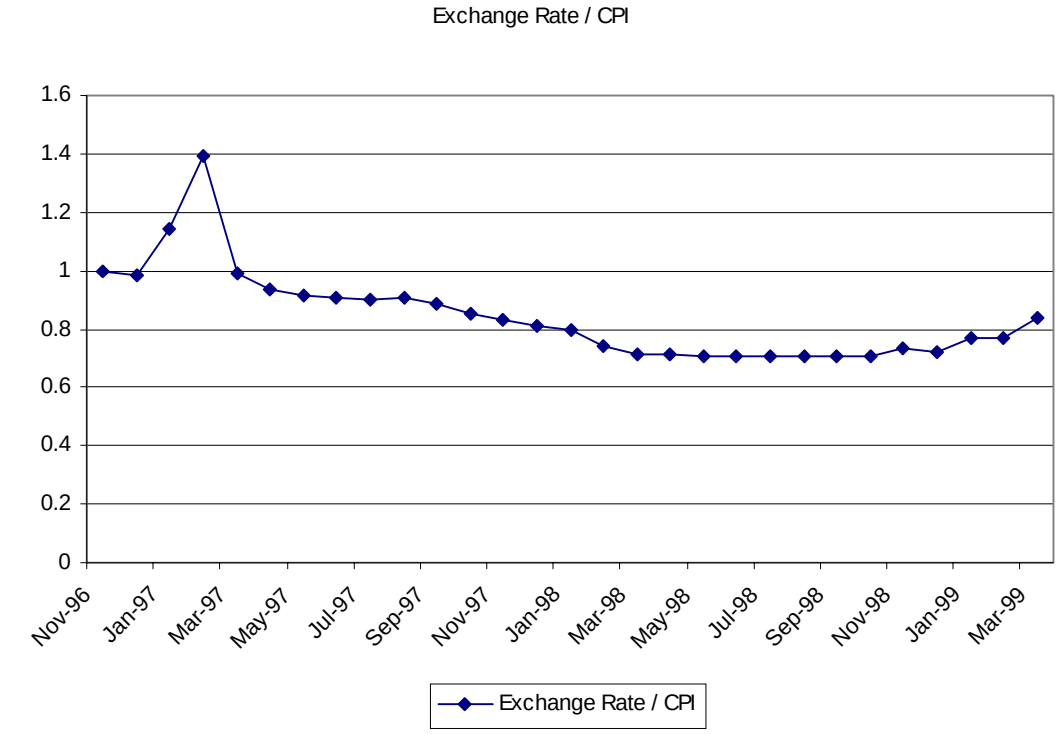
Source: National Commission for Statistics (1999).

Figure 5: Monthly $/Lei Exchange Rate



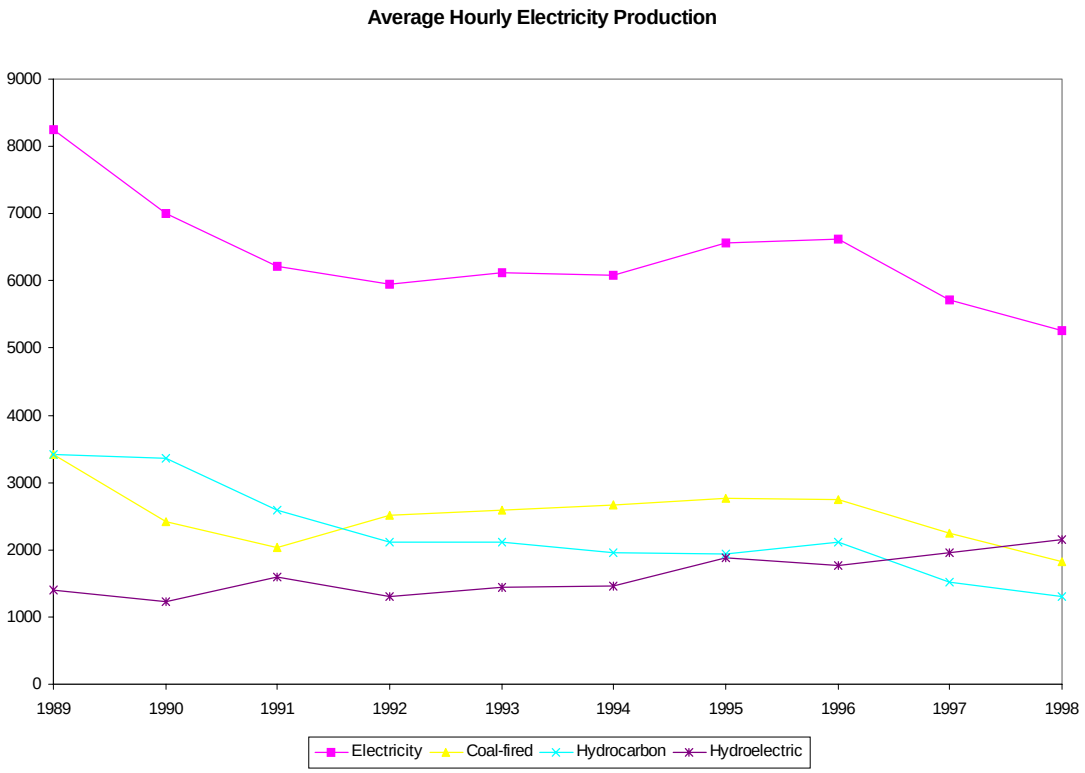
Source: PACIFIC Exchange Rate Service http://pacific.commerce.ubc.ca/xr/.

Figure 6: Monthly (Nominal $)/(Real Lei) Exchange Rate



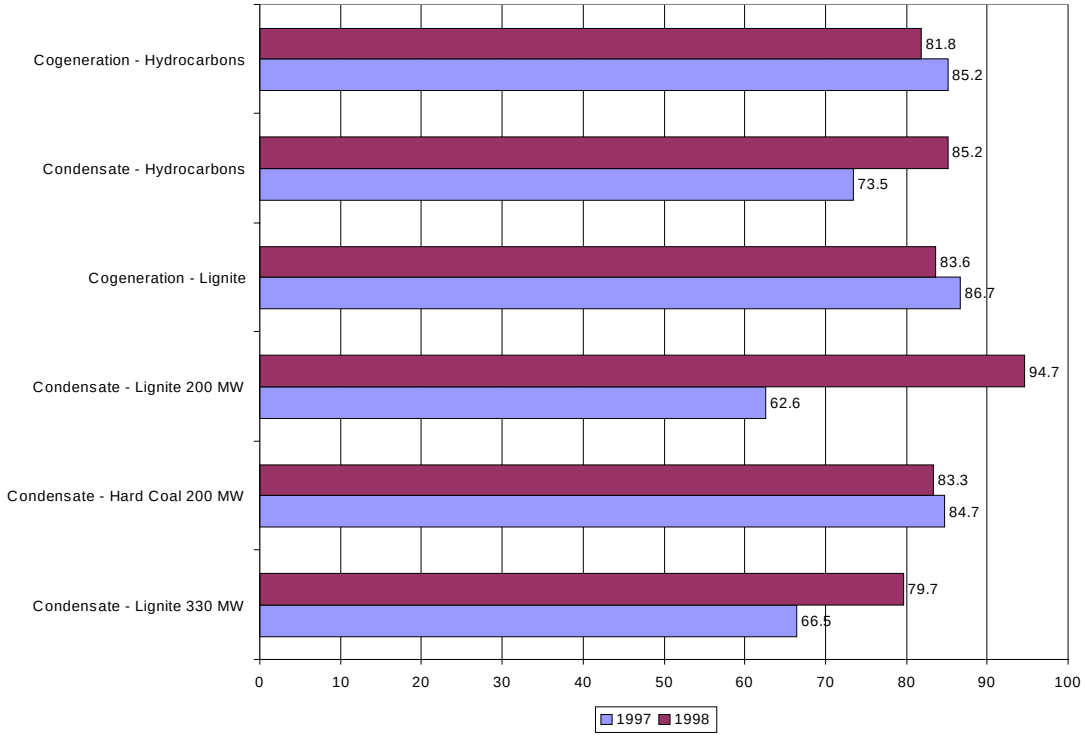
Source: Author's calculations.

Figure 7: Average Hourly Electricity Production by Fuel Type from 1989 to 1998 in MW



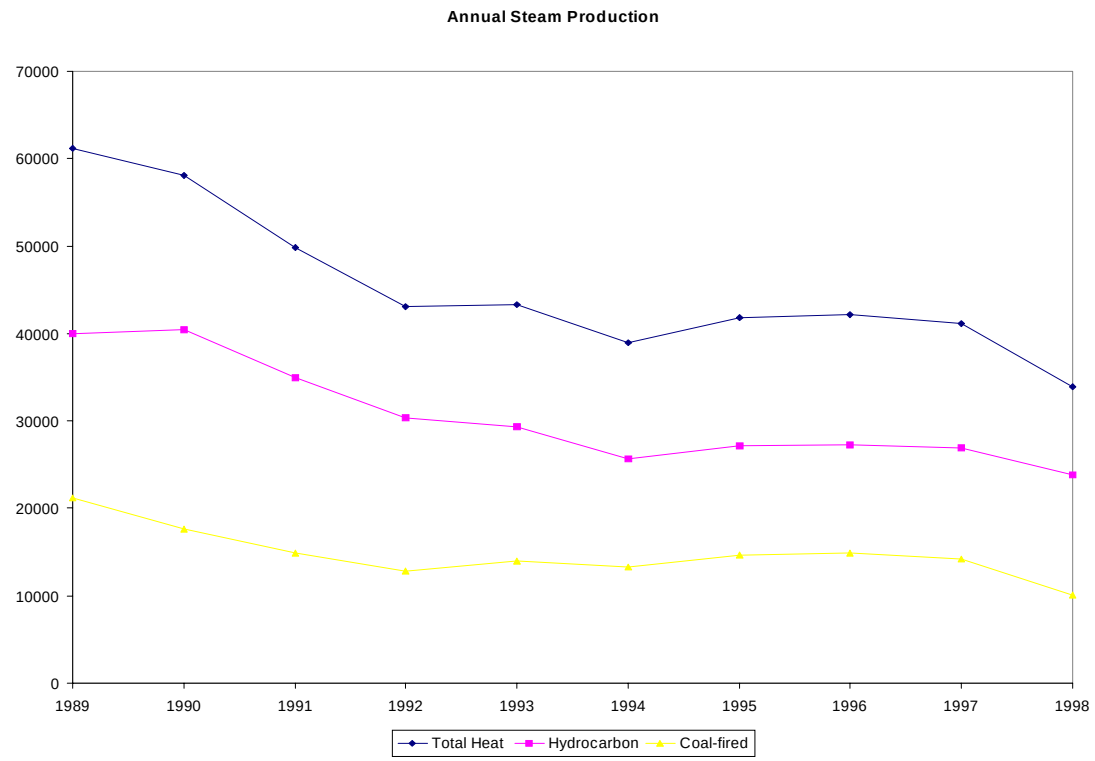
Source: S.C. Termoelectrica, S.A. (1999) page 16.

Figure 8: Availability Factors by Fuel Type in 1997 and 1998



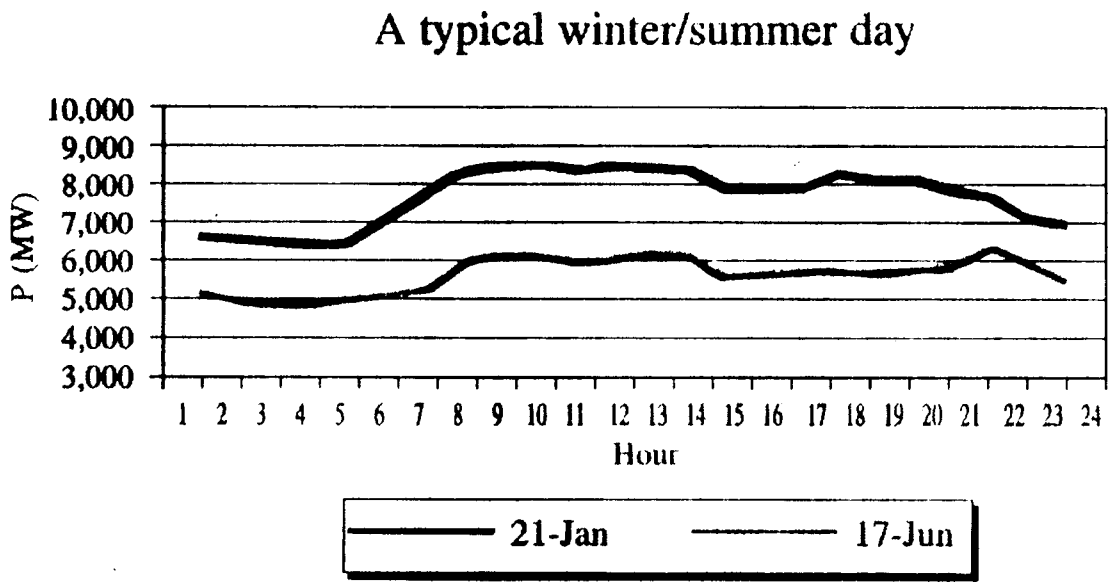
Source: S.C. Termoelectrica, S.A. (1999) page 24.

Figure 9: Average Hourly Heat Production by Fuel Type from 1989 to 1998 in Gcal



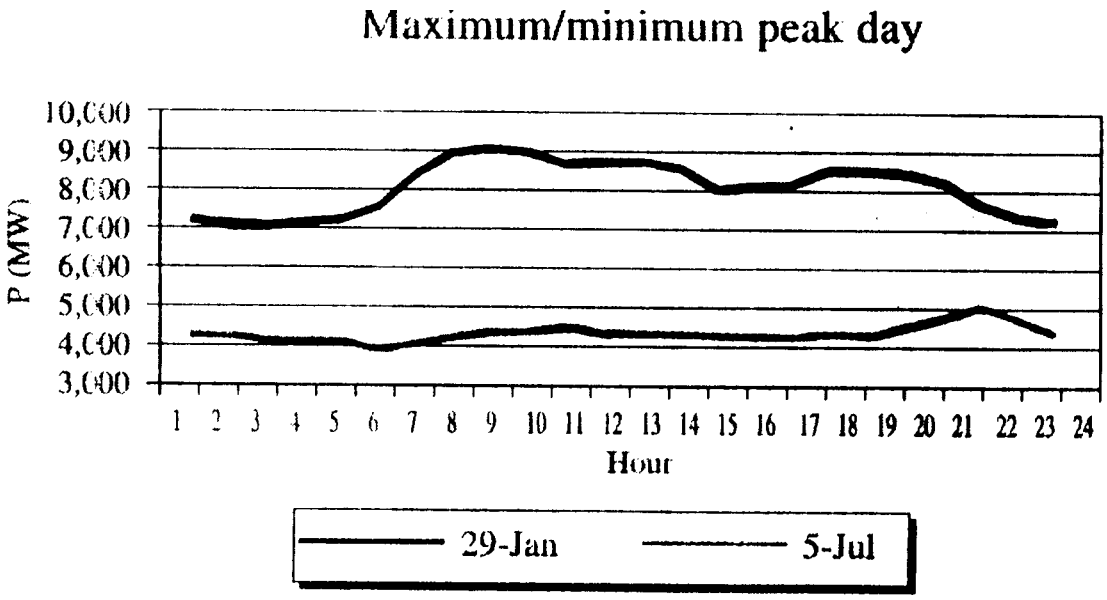
S.C. Termoelectrica, S.A. (1999) page 16.

Figure 10: Load Shape for Typical Winter and Summer Day in 1998



CONEL (1999) page 21.

Figure 11: Load Shape for Maximun and Minimum System Peak Days in 1998



CONEL (1999) page 21