JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

THE SECRETARY OF ENERGY(S.E.)
THE REPUBULICA ARGENTINA

STUDY ON AIR POLLUTION CONTROL FOR THERMAL POWER PLANTS IN THE REPUBLICA ARGENTINA

(MAIN REPORT)

SEPTEMBER 1994

UNICO INTERNATIONAL CORPORATION
SANYO TECHNO MARINE, INC.

Preface

In response to a request from the Government of the Argentine Republic, the Government of Japan decided to conduct the Study on Air Pollution Control for Thermal Power Plants in the Argentine Republic and entrusted the study to Japan International Cooperation Agency (JICA).

JICA sent to Argentina the study team headed by Mr.Yoshihide Ichiki, Unico International Corporation, four times between March 1993 and March 1994.

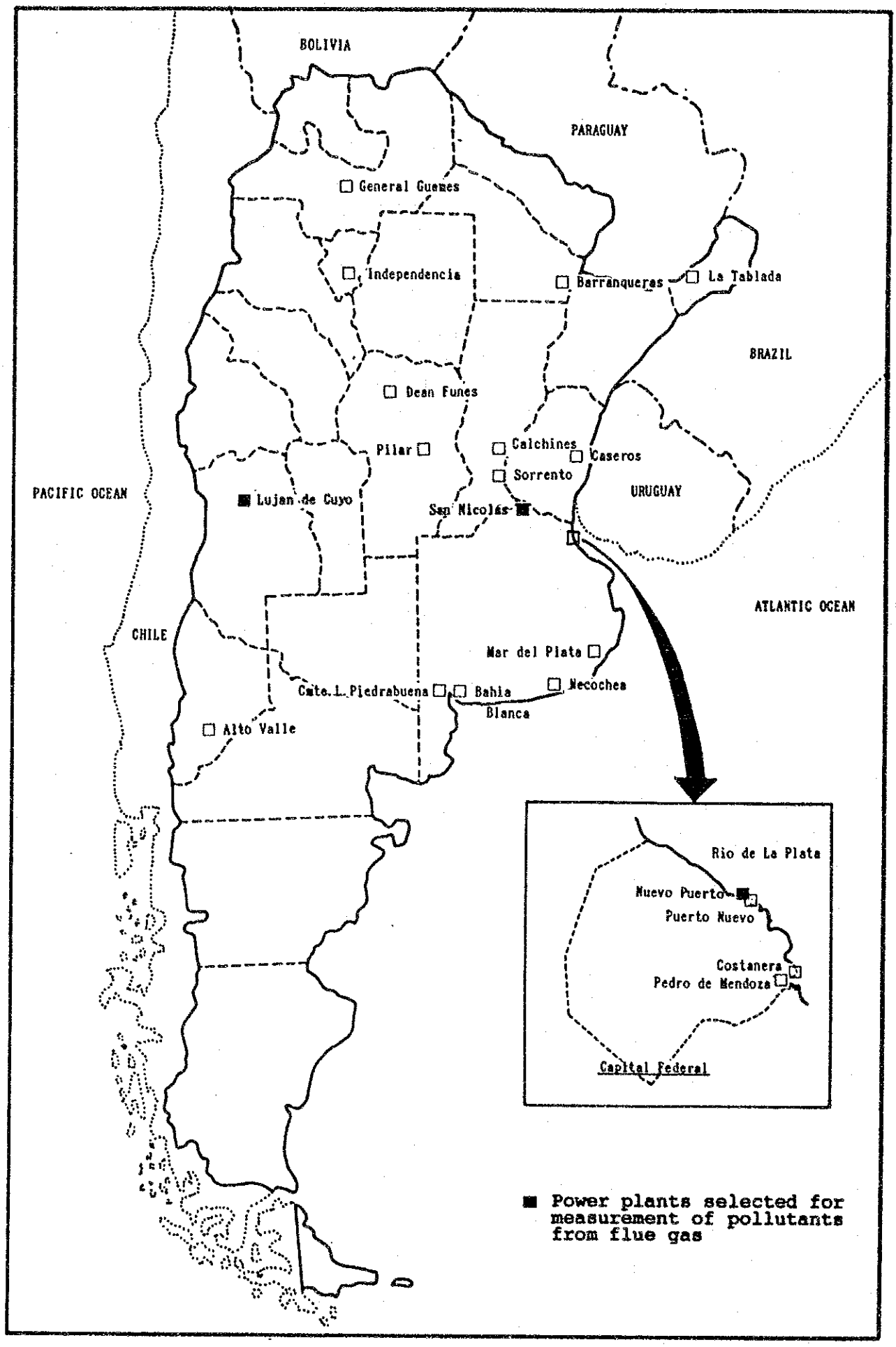
The team held discussions with the officials concerned of the Government of Argentina, and conducted field surveys at the study area. After the team returned to Japan, further studies were made and the present report was prepared.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Argentine Republic for thier close cooperation extended to the team.

September 1994

Kimio FUJITA
President
Japan International Cooperation Agency



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SUMMARY

Summary

Between 1970 and the mid 1980's the Argentine Republic suffered destructive inflation and mounting external debt resulting from political instability and failure of economic policies leading to prolonged stagnation of the economy. The current administration, however, has vigorously promoted economic reforms including privatization of national enterprises, introduction of a floating exchange rate system and freeze of excessive liquidities.
As a result, the inflation has been overcome as indicated by 1.8 percent per month decrease in whole sale prices and a mere 0.5 percent per month rise in consumer prices in November, 1992.

The overall economy as well has steadily grown as demonstrated by recent GDP growth rates: about 8.5 percent both in 1991 and 1992 and 9 percent in 1993.

In the meantime, the privatization program has continued to be implemented actively facilitating expanded investment, improved efficiency leading to economic growth and healthier national budget.

The electricity generating capacity of Argentina totals 16,235 MW while demand amounts to 39,130 GWH, 50.8 percent of which is being met by thermal power stations operating at a 36.5 percent utilization ratio. Although the major fuel used by thermal power stations is natural gas, fuel oil and coal are also used in winter when natural gas supply is short of increased demand.

The privatization program of the electricity sector initiated in 1992 was almost completed, enabling power companies to pursue active effort, for increased profitability by renovating their generating facilities. At the same time, the government is attempting to streamline its regulatory supervisory functions matching post-privatization circumstances.

The Secretary of Energy (hireinafter referred to as "SE") of the Ministry of Economics representing the Government in the field of the power sector has been formulating environmental protection policies including their detailed operational plans and are ready

to implement them in accordance with the contract between the government and power companies at the time of privatization.

In view of such evolutions, the SE of the Argentine Republic requested the Japanese government to provide managerial and technical cooperation relating to environmental pollutants discharged by thermal power stations. The two governments signed an agreement in November, 1992 followed by this study titled "The Study of Air Pollution Control for Thermal Power Plants in Argentine Republic" conducted by the mission sent in March 1993 by the Japanese government acting through the Japan International Cooperation Agency. (JICA)

Following a preliminary survey, the mission transferred technologies for measuring environmental pollution caused by thermal power stations by conducting joint operations with the SE measuring emission from typical three power stations and ambient pollutant concentration in the surrounding areas.

According to the measurement made during the second site survey, the concerned three cities are not polluted as badly as had been thought, meeting environmental quality standards of Argentina and other major countries. continued efforts need to be made, however, adequately regulating sources of pollutants with a view to matching production capacity, which in forecasted to expand keeping pace with the economic growth.

The mission discussed the outcome of the measurement mentioned above with the Argentine authorities from December 11 to 25 in 1993. The team recommended that the proposal should be made for designing for the future monitoring system on emission discharged by thermal power stations of the country in view of the current status of pollutants emission out of thermal power stations and the 3 year economic reform policies announced by the Ministry of Economics in May 1993. Namely, seven regional monitoring stations would be built in a medium term as the first step for establishing a nation-wide system for monitoring emission out of thermal power stations in accordance with SE's administrative districts and meteorological areas.

Thermal power stations have been obligated to observe emission only recently and local communities have just started to be interested in measuring pollution. Under such circumstances, staff of thermal power stations, concerned government agencies have yet to be educated in environmental technologies, combustion technologies and energy conservation technologies. In addition, national policies need to be formulated and implemented aiming at supporting industries in the field of environmental protection like manufacturing of pollutant-measuring instruments.

As present in Argentina, adequate measures against environmental pollution are not being taken either publicly or privately. As the thermal power generating in Argentina, this proposed project will provide a pioneering model plant and be of great significance to the country playing a leading role in the Argentine Republic and also the MERCOSUR.

Chapter 1 INTRODUCTION

Chapter 1 Introduction

The Secretary of Energy (SE) of the Ministry of Economics of the Argentine Republic started to privatize thermal power plants under SE since April, 1992 in accordance with the country's privatization policy, Accordingly, SE has begun to implement its environmental policy measures by regulating concentration of pollutants emissions out of thermal power plants, obligating measurement of such pollutants and implementing environmental assessment of thermal power plants' surroundings SE, therefore, now needs to measure SOx, NOx and dust contained in emissions from thermal power plants and atmosphere, and to develop and/or establish technologies for such measurement.

Under such circumstances, the SE requested the Japanese Government to provide technical cooperation concerning "A Study on Air Pollution control for Thermal Power Plants", meeting this request, the Japanese Government conducted a preliminary survey and fact finding survey in the July and August of 1992, leading to the agreement in November, 1992 by the Japanese and Argentine Governments for conducting this study.

Pursuant to this agreement, the Japanese Government acting through the Japan International Cooperation Agency (JICA) studied the current status of thermal power plants from March 6 to March 31, 1993 and chose three stations which would monitor SOx, NOx and dust in thier emission, subsequently from June 20 to September 22, JICA measured emission out of the Central Puerto, Lujan de Cuyo Power Station and Central San Nicolas Power Station and pollutant concentration of their vicinity in collaboretion with SE, and through these activities transferred technologies concerning measurement of emission from flue gas and in ambient air.

On the basis of these measurement outcome

(a) to evaluate contribution of ambient pollutants out of thermal power plants to the total pollution of the country, and
(b) to recommend SE's future policy measures for preventing

environmental pollution to be caused by Thermal Power Plants including installation of regional emission monitoring stations to be altimately needed, in accordance with the country's medium and long term energy/electricity forecast program based on the 3 year Economic Development Plan announced by the Ministry of Economics in May, 1993.

Chapter 2 SOCIOECONOMIC CONDITIONS RELATED TO THERMAL POWER PLANT IN ARGENTINA

Chapter 2 Socioeconomic Conditions Related to Thermal Power Plant in Argentina

2.1 Country Profile

2.1.1 Outline of the Country

The foundation of the country is laid in 1816 when the independence from the rule of Spanish Emperor was realized. Since that time the development of the country continued consistently with the help of rich, agricultual productivity of the country.

In particular, during the time of 1910's the Argentina developed her agriculture as one of the largest suppliers of agricultural product to the international market, and the status of the country was established as one of the richest countries in the world.

People: It is generally considered that Argentina is the most europeanized country in the South America and the life style of majority of people in the country is very similar to that of Europe. The majority of population at present is the descendants of Spanish and Italian. In addition, substantial number of people are descendants of France, Poland, Russia and Germany. The population was 32,610,000 persons in 1991.

Society: It is well-known that the medical care and the sanitary conditions in the country are quite excellent, which have been maintained by the high living standard of the nation, and therefore there are very little epidemics in the country.

Religion: The majority of the inhabitants is Catholic and the Catholic is accepted as the national religion, however, the freedom in religion is assured by the constitution.

Education:

The level of education in Argentina is also very high. Primary education is compulsory and free for all children

from six to fourteen years of age. There are many universities such as Buenos Aires, Cordoba, La Plata, Santa Fe, Tucuman and Cuyo where the students from other Latin American countries are studing.
It is also well-known that the illiteracy in the country is the lowest in the South America.

Culture: Argentina's cultural life has always had a European orientation. The basic heritage of spanish culture has been maintained in the every field of cultural activities.
In addition, strong influence of France to art and culture of Argentina are observed in similar way of other Latin American countries.
In Buenos Aires, there are more than 60 art galleries, museums, theaters and concert halls. The other large cities also have many such facilities.

Transportation:
Argentina has the most developed railway system in Latin America with 40,000km of railroad line, and the well prepared high way connects the most of major cities in the country.
The navigation and air line system well cover the major parts of the country.

2.1.2 Geographical Background

Argentina occupies the southern most part of the South American continent, extending over 4,000km in a north-south direction. With a long coastal line on the east and the Andes forming a backbone of the continent on the west (the highest peak of 6,959m), the country is endowed with rich and diverse geographical features and resources.

Geographically, the country is roughly classified into a forestcovered northern area under warm and rich precipitation climate, the vast pampas suitable for agriculture including Buenos Aires (Federal capital), the highland area (Patagonia)

under dry, cold and windy climate, and the mountainous area along the Andes.

The pampas are the center of agriculture and livestock farming in the country and also accommodate major industrial activities and large cities including Buenos Aires, Santa Fe, and Rosario.

The western area along the Andes is rich with mineral resources including iron, copper, and uranium, and petroleum and natural gas. Oil and natural gas are also produced in Patagonia.

The country has major hydropower generation facilities in the western area which is endowed with water melted from snow on the Andes, and the northern rivers originating in Brazil, Paraguay, and Bolivia.

Country Profile

•Country Name:	Argentine Republic (La Republica Argentina)
•Land Area:	2,791,810km^2 (7.3 times Japan)
•Population:	32,610,000 (1991)
•Capital:	Buenos Aires with 2.96 million population (1991)
•Language:	Spanish
•Religion:	Predominantly Catholic (90% of population)
•Political system:	Constitutional democratic
•Parliament:	2 houses, upper house (46) and lower house (254)
•Administration units:	1 federal capital, 23 provinces
•Date of independence:	July 9, 1816
•Currency:	1 peso = 1US$
•GDP:	US$93,260 million (US$2,370 per capita in 1990)

2.2 Economic Condition

2.2.1 Macro Economics of Argentine

(1) Present Condition of Macro Economics

Foreword

The recent development of economy of Argentine indicates clearly the success of economic policy of the present government headed by the President Menem.

The following records of GDP growth, Gross Fixed Investment and annual variation of consumers price disclosed in 1993 by the report of "Ministerio de Economia y Obras y Servicios Publicos" shows the remarkable improvement from the past.

GROWTH RATE OF GROSS FIXED INVESTMENT

Year	%	Year	%
1980	5.0	1987	14.8
1981	-16.3	1988	-2.0
1982	-16.4	1989	-24.4
1983	-0.7	1990	-9.9
1984	-3.4	1991	25.1
1985	-17.8	1992	30.9
1986	15.2		

GDP GROWTH RATE AT CONSTANT PRICES

Year	%	Year	%
1980	1.5	1987	2.6
1981	-5.7	1988	-1.9
1982	-3.1	1989	-6.2
1983	3.7	1990	0.1
1984	1.8	1991	8.9
1985	-6.6	1992	8.7
1986	7.3		

ANNUAL VARIATION IN CONSUMER PRICES

Unit:Annual percentage
Period:1975-1990

Period	General Level Consumer Prices
1975	335.0
1976	347.5
1977	160.4
1978	169.8
1979	139.7
1980	87.6
1981	131.3
1982	209.7
1983	433.7
1984	688.0
1985	385.4
1986	81.9
1987	174.8
1988	387.7
1989	4923.6
1990	1343.9
1991	70.3(Dec)
1992	17.5
1993	6.5(expected)

(2) Macro Economic in the Past

As it is well known to the people, the Argentine Republic enjoyed economic prosperity during the early part of 20th century as a leading supplier of agricultural products to the world.

However, the long lasted nationalistic & socialistic economy in the country after the world wide recession resulted macroeconomic instability in the country. The problem of huge deficit of national financial balance caused by inefficient public sector enterprises which is running major part of national economy, resulted serious debt crisis in foreign and domestic borrowing. Debt service strained public finances and created a severe internal transfer problem. Public sector finances had run out of control, and the inflation was running several hundreds percent annually, and the investors lost confidence.

In 1983, the people of Argentine restored a democratic government to achieve political stability and improving living standard of the nation, but the real reforming of the country in several aspects could not take shape until 1989, when President Menem started fundamental economic reform of the country.

In spite of heavy negative heritages in national economy succeeded from preceding government, the improvement of macro economy of the country in these three years are remarkable as it is indicated in the economic indicators in the above tables.

(3) Outline of economic reform achieved

Now, the Government declared that the country is firmly set on nourishing the rapid growth of the economy to increase the welfare of its people and recover the ground lost during previous decades.

There are many economic reform have been implemented and are still continuing. In the followings, the major subjects are described.

1) Restructuring of internal and external debt

Public internal debt

In the past the public account deficits were financed by the indiscriminate placing of government securities in australes at high rate of interest and restatement clauses, as well as by the growing immobilization of deposit taken by financial institution, by mean of frozen reserve requirement.

This policy resulted in a flight from domestic currency and demonetization of economy and hyperinflation.

In order to solve the problem, the elimination of monetary financing to cover the public sector deficit and restructuring and reprogramming of existing debt for terms and at rates in line with the state's ability to repay commitment assumed is conducted.

External public dept

The problem generated by excessive external indebtedness by the public sector was faced by three year program (1992-1994) with guide lines on payment capacity and parameter for the evolution of public debt for the rest of decade. The IMF approved this program and extended fund agreement was reached with the IMF, as well as, agreement with the Paris Club and with commercial banks under the Brady Plan.

2) Tax Reform

In the past the tax are heavily oriented on import/export tax, commodity transaction and inflation. The reform is orienting to move towards value added tax, company income tax and personal gain and assets tax.

In addition the reform is aiming to improve collection of tax by reinforcing regulation and improving control and revenue collection system.

3) Monetary Reform

The convertibility law established the convertibility of the austral to the United States dollar at A = 10,000 = one US$ from April 1, 1991. This law also determine followings,

* The BCRA (National Bank) was obliged to sell foreign currency as required by the market at the rate indicated, with drawing the australes purchased from circulation.

* At all time the freely available international reserves (gold + foreign currency) should be equivalent to at least 100% of the monetary base.

* The reserves from the common lien for the monetary base, are not subject to embargo of any kind and can only be utilized as indicated in the law.

* In no case will monetary restatement, price or cost variation indication or adjustment of outstanding be allowed, whatever the cause and whether the debtor is in arrears.

4) Privatization Program

During 1989-1992 the National Government carried out a vast program for privatization of most of the national public sector companies, as an essential ingredient in the process of state reform.

The process of privatization has covered most of the public companies held by national government and a wide range of economic sector from telephone, electricity, water, gas, petrochemical industries, ship yards and steel mills, as well as concession of air transport services, rail road,

ports and high ways.

The over-all picture of the privatization achieved is shown in the following tables

FINANCIAL RESULT OF THE PRIVATIZATION PROGRAM

Unit: Millions of current dollars.
Period: Jan. 1990 - Mar. 1993.

Sector	Form of Transfer	Cash	Securities Cash Value	Liabilities Transferred	Total
Telephone	Sale of shares	2270.9	1257.0	-	3527.9
Airlines	Sale	260.0	483.0	-	743.0
Railrords	Concession	-	-	-	-
Electric Sector	Sale	330.3	1162.2	460.7	1953.2
Ports	Concession/Sale	6.0	-	-	6.0
Highways(1)	Concession	-	-	-	-
Television and Radio	Concession	13.9	-	-	13.9
Oil	Joint Ventures Concession	1973.2	-	-	1973.2
Gas	Sale	300.0	1541.1	1110.0	2951.1
Water and Sewerage(2)	30-year Concession	-	-	-	-
Industry:					
Petrochemicals	Sale of shares	66.5	30.8	-	97.3
Naval dockyards	Sale	59.8	-	-	59.8
Steel	Sale	143.3	22.1	-	165.0
States properties	Sale	107.0	-	-	107.0
Others	Sale/Concession	65.2	2.4	-	67.6
Total Amount		5596.2	4498.5	1570.7	11665.4

Notas:
(1) Concession-holders contribute US$100 million annually on 10,000km of national highway
(2) Awarded to the bidder offering the largest discount on the tariff:26.9%

Source: Economic Planning Secretariat, on basis of data from the Privatizations Under-Secretariat.

EQUITY OWNERSHIP OF PRIVATIZED COMPANIES

Ownership	Holding value US$	%
-Domestic Companies	4,712	28.0
-Foreign Companies	6,952	41.4
-State	5,153	30.6
Total:	16,817	100.0

(Values stated in Millions of dollars).

INVESTMENT COMMITMENT BY PRIVATIZED COMPANIES

Sector	1993-1995
-Drinking water	561
-Electricity	1,153
-Fuel	799
-Transport	1,528
-Communications	3,749
Total:	7,790

(Values stated in Millions of currents pesos).

5) Others

In addition to above mentioned subjects, elimination of deficit from government finance, the modernization of labor related law regulation, deregulation and liberalization of trade, elimination or reduction of subsidy for protection of domestic industries are included in the national reform program.

(4) Prospect of Economic Development

As it is mentioned at the first part of this chapter, the economic reform of the country proceeded successfully in these three years, and the Government now disclosed its three years economic development projections (1993-1995) as follows;

RATES OF GROWTH

1986 Constant prices					
	gdp	c	i	x	m
1990	0.1%	-0.4%	-9.9%	18.9%	0.7%
1991	8.9%	12.6%	25.1%	-8.3%	64.9%
1992	8.7%	10.8%	30.9%	0.6%	63.1%
1992 Constant prices					
	gdp	c	i	x	m
1993	6.5%	4.6%	15.4%	2.0%	1.0%
1994	6.5%	4.8%	12.2%	8.0%	3.0%
1995	6.5%	5.0%	11.7%	8.0%	4.0%

Notes:
gdp = gross domestic product
c = consumption
i = investment
x = exports of goods and services
m = imports of goods and services

Source: 1990-1992:BCRA;1993-1995:projections by SPE

2.2.2 Government Policy on the National Economy

General

Following the successful economic reforming of the country in the past three years, the Government of Argentine now intending to lead the economy of the country towards sustained growth. The targeted growth of GDP during 1993 - 1995 is 6.5%, which is slightly lower than that of 1991 - 1992, about 9.0%.

The preconditions of such growth are continuation of investment at highly dynamic level and the growth of exports, which is the results of the increase in competitiveness obtained with the maturing of investment carried out from 1990 and the productivity improvement by the structural reform which is still proceeding.

It is expected also that the export will be stimulated by recovery in the international economy in general and in particular in the area of the MERCOSUR member countries.

The objective of the policy to achieve sustaining growth will be realized through improving real income of people, which will be essential to increase domestic investment from increased saving, improving of balance of payment in international trade by increasing export, improving the productivity of the country through improvement of management capability and introduction of modern technology.

It is also considered very important to maintain high level of investment from abroad to sustain the targeted growth. The stability of national politics and the national economy including present value of Argentine currency.

The present government pursue the development of free trade among the countries in the region, MERCOSUR(Argentine, Uruguay, Paraguay, Brazil) and also hoping to increase the countries, with which free trade relationship can be established.

Presently, the trade between Argentine and other MERCOSUR countries are increasing rapidly, and the arrangement to

accerelate mutual investment program to establish common external tariff system to do macro economic coordination etc are being proceeded.

Energy Sector

These open economy policy and the privatization policy are naturally extended to the energy related sectors in the country.

The participation of foreign investors to these sector are being encouraged, and many parties have acquired the share of privatized energy sector companies.

The results of privatization and deregulation of petroleum production and natural gas production are activating the activities in this sector in production increase direction.

The exploitation of oil and gas reserves is being promoted through the program of "Argentine Exploration Plan" under the Energy Secretariat. It is considered that the present petroleum supply situation, almost full domestic supply, will be changed very soon because Argentine has crude oil reserves for the next nine years only. Presently, the future development of energy related sector are basically depends on the behavior of private parties based on "market economy mechanism".

Environment Protection

It is observed that the basic policy of the present Government on this respect is "the maintaining of sustainable development". In another word; The necessity of the conservation of environment have now reached critical level in some cases and such cases must be treated with high priority. However, "Measures" have to be carried out gradually to avoid the imposing of excessive burdens on the private sector.

However, the Government indicates several specific measures to be taken by each sectors for environmental protection.

In the followings such instructions are described:

1)	Agricultural Sector		
	Regulating of production and manufacture food products of animal origin obtained organically or ecologically. Setting up of registers of production establishments and entities certifying organic or ecological products.	1993	Updated regulatory framework and initial register of establishments and certifying
2)	Agriculture Sector		
	Sustainability: Conservationist agriculture (PAC II), in the main agricultural area of the pampean region (12 million hectors).	1993-1996	Adoption of conservation technology. by 11,000 farmers, with 5% of the area systematized and 30% of farmers using integrated weed management and pest control techniques.
3)	Agriculture Sector		
	Prevention and control of desertification in Patagonia.	1993-1994	It is estimated that 6.5 million hectors will have an adjusted live-stock load.
4)	Mining Sector		
	Control over the use of the fund created by the mining investment law for the preservation of the environment, set at 5% of the operating costs of mining exploitation, deductible for income tax purposes. Requirement by the mining authorities for a declaration of environmental impact from all companies in the sector.	As from 06/1993	Restoration of the environment from consequences of mineral exploitation.
5)	Industry Sector		
	Coordination of standards on industrial promotion, environmental pollution		
6)	Energy Sector		
	Completion of diagnosis of polluting emissions by thermal power stations.	01/1994	

7) Energy Sector (YACYRETA)

Achievement of satisfactory environmental protection through fulfillment of specific plans.		

8) Energy Sector (Environment)

Regulation of downstream operation to permit the preparation of an integrated operating standards manual. Creation of joint administrative mechanisms for national and provincial authorities and the industrial sector that will permit adequate implementation of environmental protection standards. Establish coordination requirements with other areas of the national government on environmental matters.	1993-1994	Environmental protection.

9) Transportation Sector

Appropriate measures for the elimination of the problem of environmental pollution caused by passenger vehicles.	12/ 1993	

2.3 Economic Activities in Each Sectors

Forward

The macro-economic indicators of Argentine indicated very strong recovery of the economy since 1990, and the growth of G.D.P. of the country achieved 8.9% in 1991 and 8.7% in 1992. The growth rate in the coming years, which is indicated by the Government economic development plan" Growing Argentine 1993-1995", is considered as 6.5% annually.

However, the growth of each economic sector was not even across all sectors and sub-sectors. In the following outline of the activities of each sectors is described:-

(1) General Outlook

The recent economic development has been leaded by increase of consumption and increased investment, which are the result of over-come of severe inflation and the improved availability of credit. The increased internal saving and steady inflow of capital from abroad are sustaining present economic activities.

(2) The sectors maintaining high growth during 1992 and first part of 1993 are;

1) Consumer durable such as automobile, refrigerator, washing machine. The production of refrigerator and washing machine achieved historical record in 1992 and continues favourable activities. Automobile production increased 62.3% in 1992 from the previous years.

2) Consumer non-durable such as soft drink, beer, cracker and vegetable oil growth exceeds 10% in 1992.

3) Construction and its related sector

Construction activities in private sector including privatized public sector portion continuing high growth, and

the production and consumption of cement is continuously increasing.

4) Petroleum production. As the result of de-regulation and improved management under the concession contract the production of crude oil recorded historical highest production 32 million cubic meter in 1992.

5) Capital Goods manufacturing is in good condition because of high demand in the country.

(3) Sector wise, the production is showing sharp contraction

1) Steel industry. Because of restructuring of the industry and exposure to the international market, which impose very difficult competition at present, resulted decline of production.

2) Chemicals/Petrochemical. There is some producers, who still maintain favorable activities, but generally speaking most of manufacturers of chemicals/petrochemical are facing declining of production because of severe competition with the international suppliers.

3) Intermediate Goods. Similar to chemicals manufacturing, the intermediate goods sector facing strong competition from outside and its production is contracting.

(4) The production activities of each sectors in 1992 and in first quarter 1993 is indicated in the following Table:-

GOODS PRODUCTION 1992

	% increase over prio year (*)
MINING	
Crude Oil	13.0
Natural Gas	-1.2
MANUFACTURING	
FOODSTUFFS	
Flours	-13.2
Vegetable Oils	10.7
Biscuits	13.8
BEVERAGE	
Alcoholic Beverages	9.0
TEXTILES (**)	
Cellulosic Yarns	-3.3
Synthetic Fibers	-0.6
Synthetic Yarns	-4.6
PAPER	
Paper	2.6
Paste for paper	6.7
CHEMICAL	
Ethylene	15.3
P.V.C	-18.4
Sulphuric Acid	-8.5
Caustic Soda	-18.1
Oil Refining (**)	6.9
Liquid Gas (**)	15.1
Gasoline (**)	1.4
Gas Oil (**)	11.0
Soaps	21.6
BASIC METALS	
Crude Steel	-13.5
Finished Rolled Sheets	-13.1
Plane Rolled Sheets	-33.1
Non-Plane Rolled Sheets	29.2
Seamless Tubes	-18.4
Cold Rolled Planes	3.9
Primary Aluminum	-8.9
MACHINERY AND ELECTRONIC APPLIANCES	
Refrigerators	44.8
Washing Machines	39.7
Automobiles	94.5
Vans	63.2
Trucks and Buses	73.2
Total Motor Vehicles	89.3
Tractors	29.6
CONSTRUCTION	
Building Licenses, Number	-3.6
Building Licenses, Area	31.3

(*) First eleven months of each year
(**) First ten months of each year
Source: Ministry of Economy

GOODS PRODUCTION
(% variation compared to the same period of 1992)

	1st Quarter 1993
MINING	
Crude Oil	7.0
MANUFACTURING	
FOODSTUFFS	
Flours	0.9
Vegetable Oils	13.8
Biscuits	15.0
BEVERAGE	
Alcoholic Beverages	3.2
TEXTILES (**)	
Cellulosic Yarns	43.6
Synthetic Fibers	-49.2
Synthetic Yarns	-10.6
PAPER	
Paper	-18.8
Paste for paper	-9.9
CHEMICAL	
Ethylene	-11.6
P.V.C	-40.4
Sulphuric Acid	-14.7
Caustic Soda	-22.7
Soaps	9.4
BASIC METALS	
Crude Steel	14.3
Finished Rolled Sheets	20.8
Plane Rolled Sheets	53.8
Non-Plane Rolled Sheets	-4.2
Seamless Tubes	-19.4
Cold Rolled Planes	20.1
Primary Aluminum	32.3
MACHINERY AND ELECTRONIC APPLIANCES	
Refrigerators	-8.9
Washing Machines	45.9
Automobiles	40.8
Vans	33.7
Trucks and Buses	10.9
Total Motor Vehicles	38.6
Tractors	-72.9
CONSTRUCTION	
Building Licenses, Number	4.0
Building Licenses, Area	4.7

Source: Ministry of Economy

(5) The production record of major sectors in recent years are indicated in the Figure:-

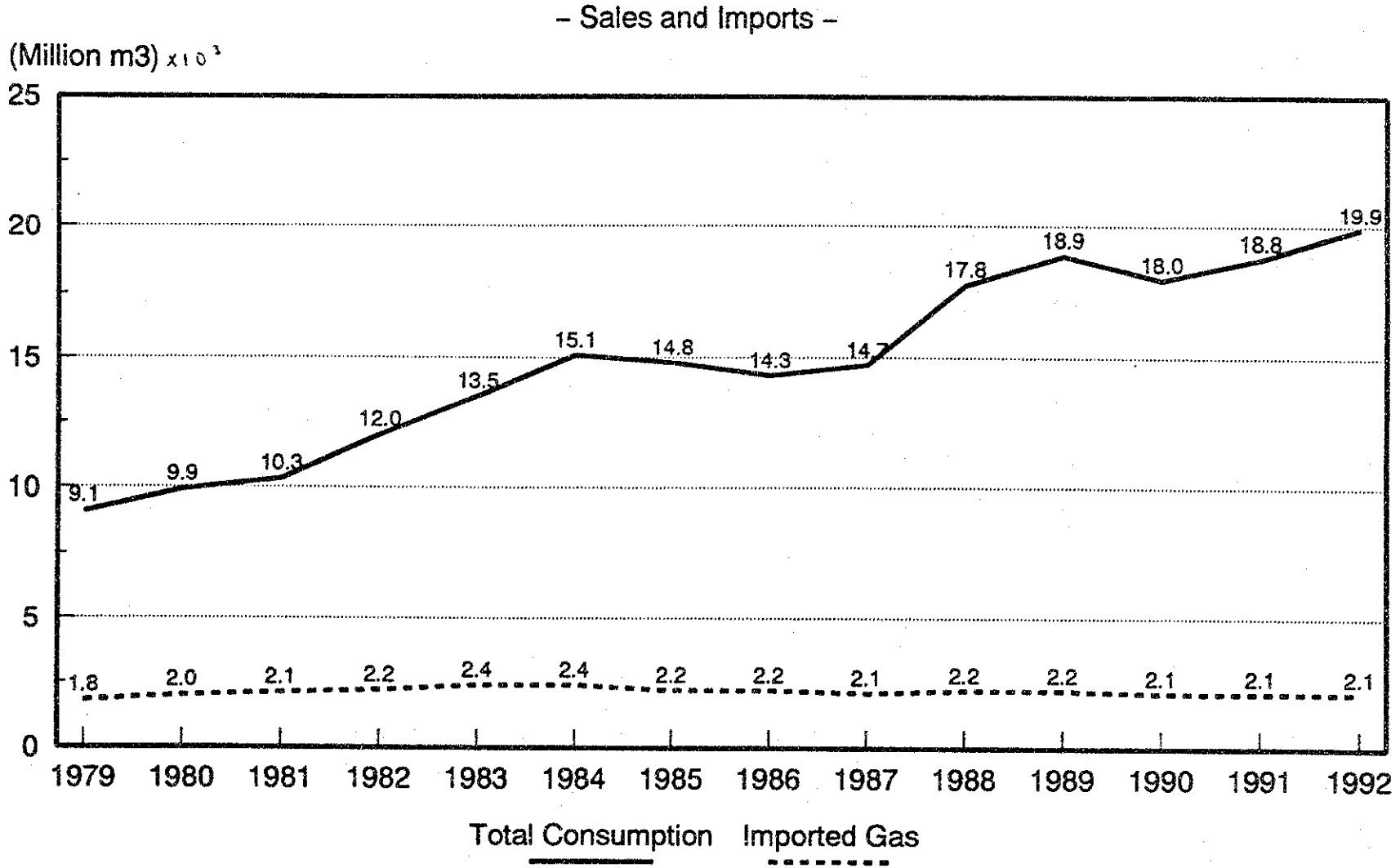


Figure 2-3-1 NATURAL GAS

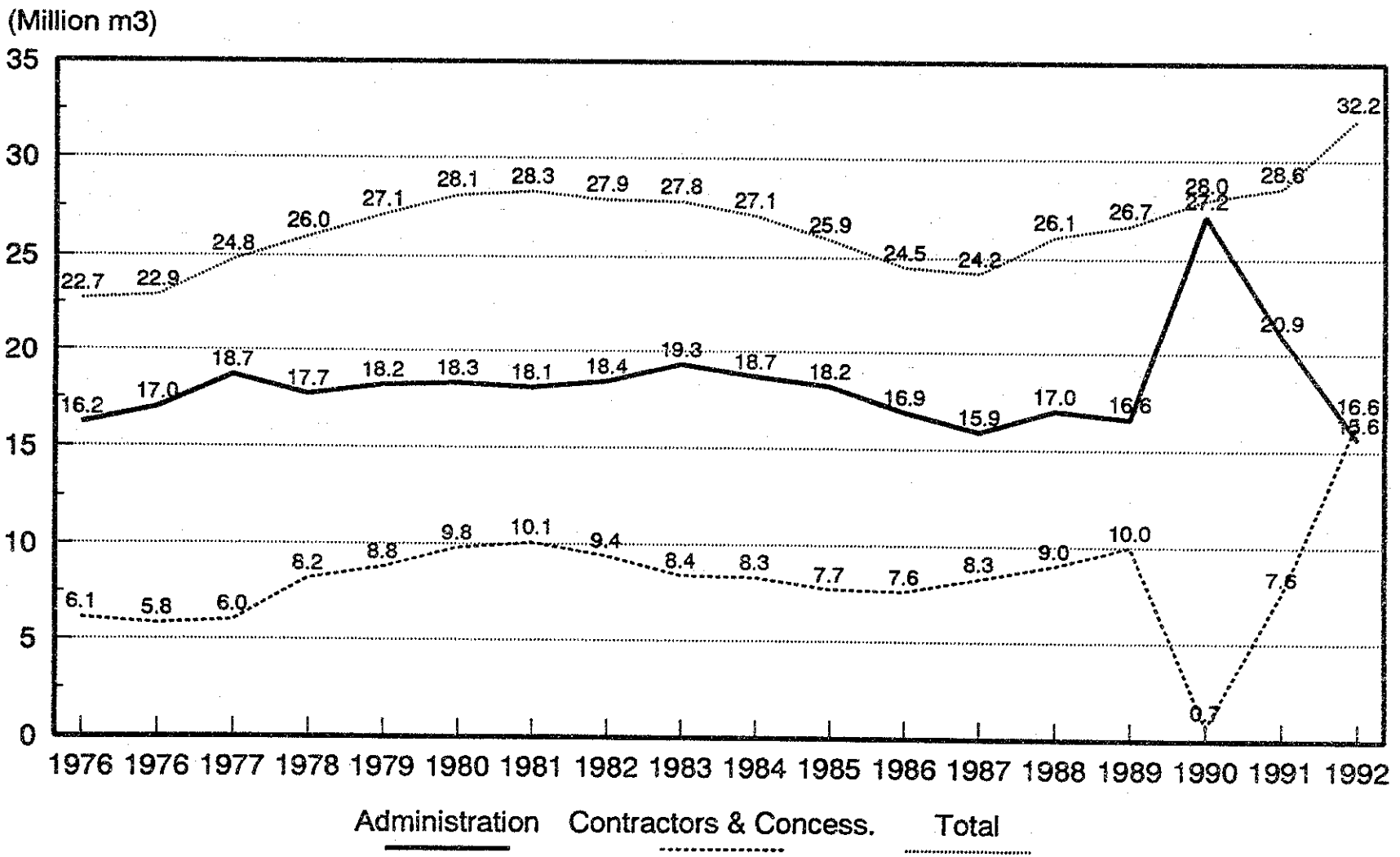


Figure 2-3-2 PETROLEUM OUTPUT (CRUDE)

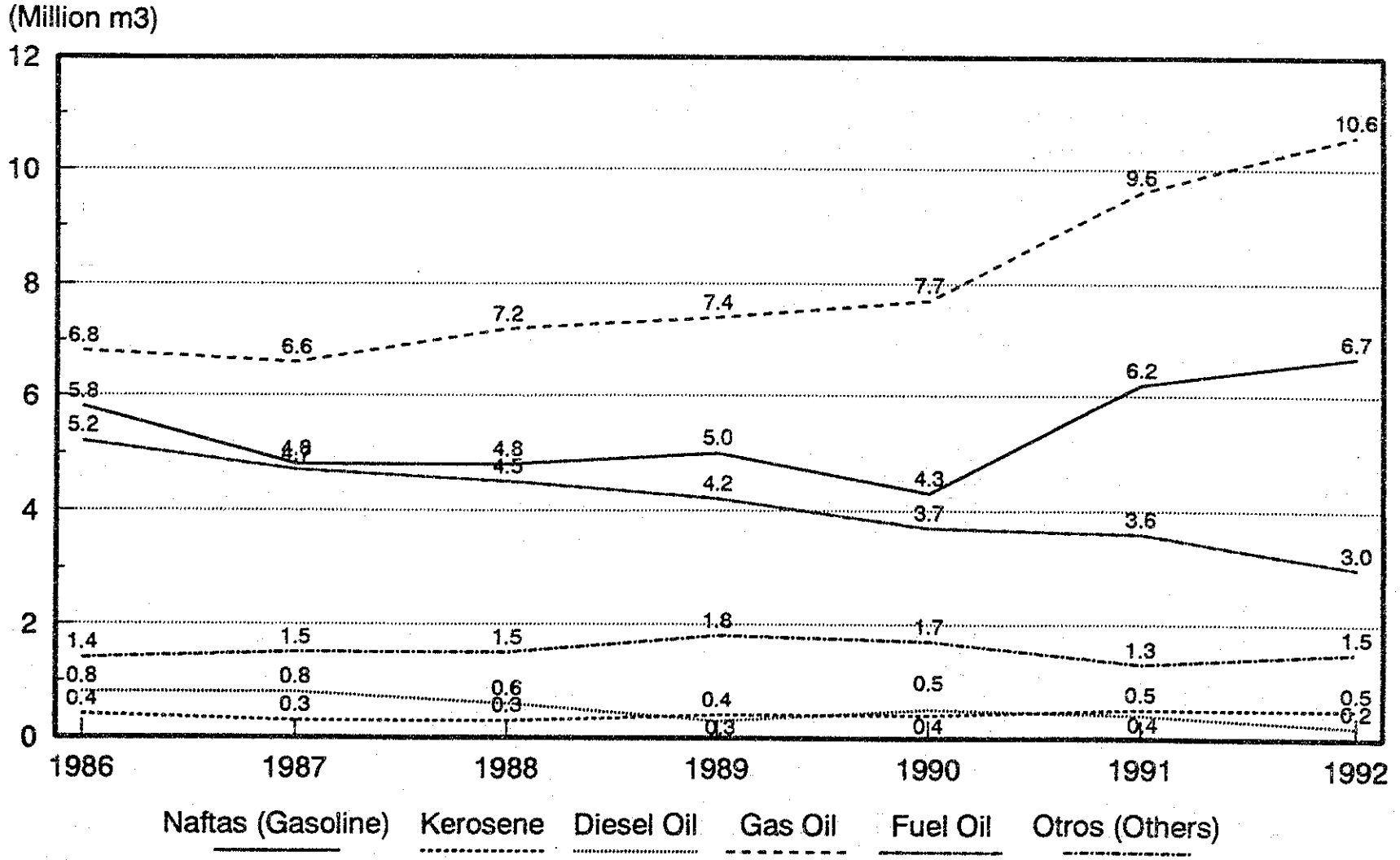


Figure 2-3-3 PRODUCTION OF PETROLEUM BY-PRODUCTS

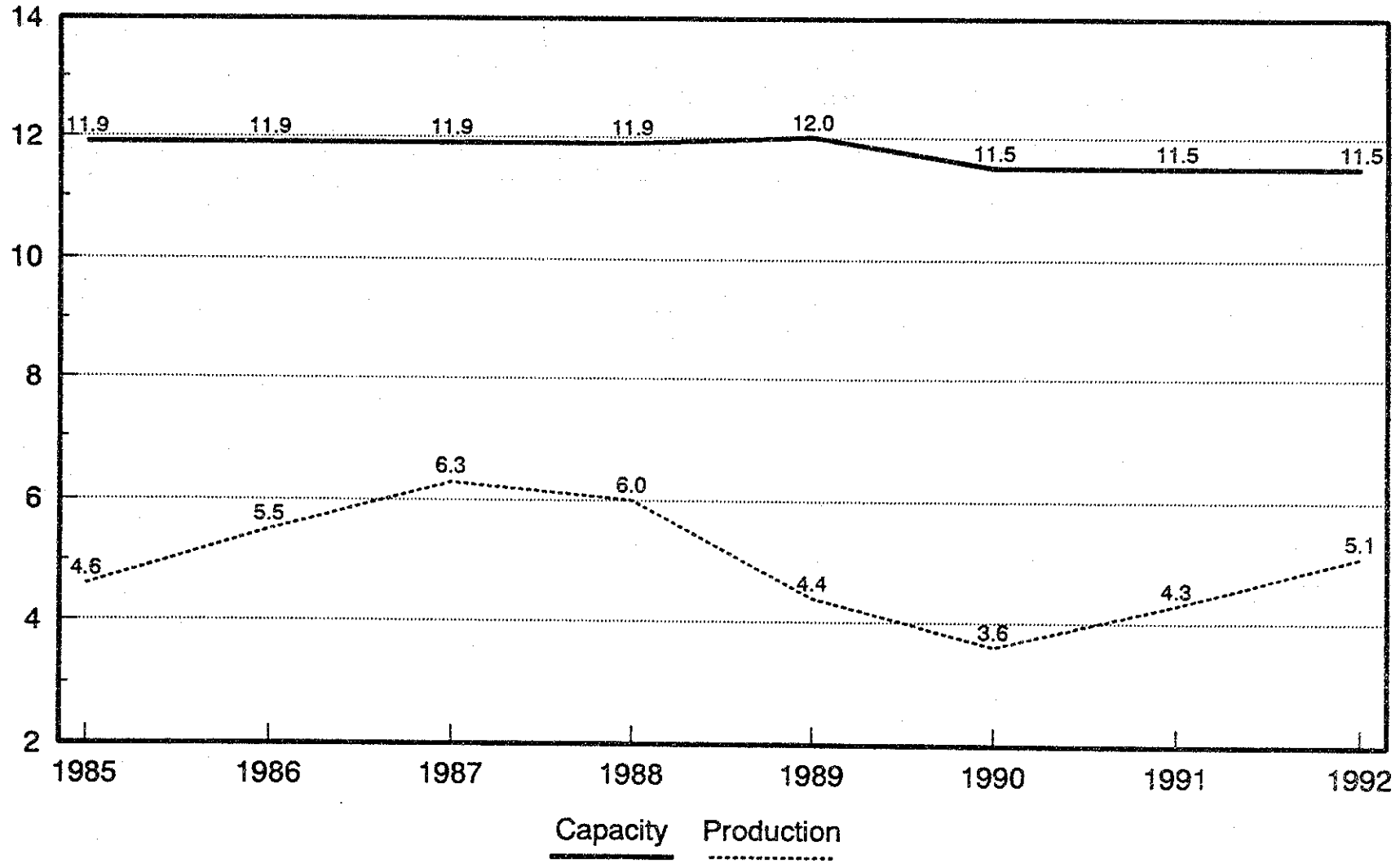
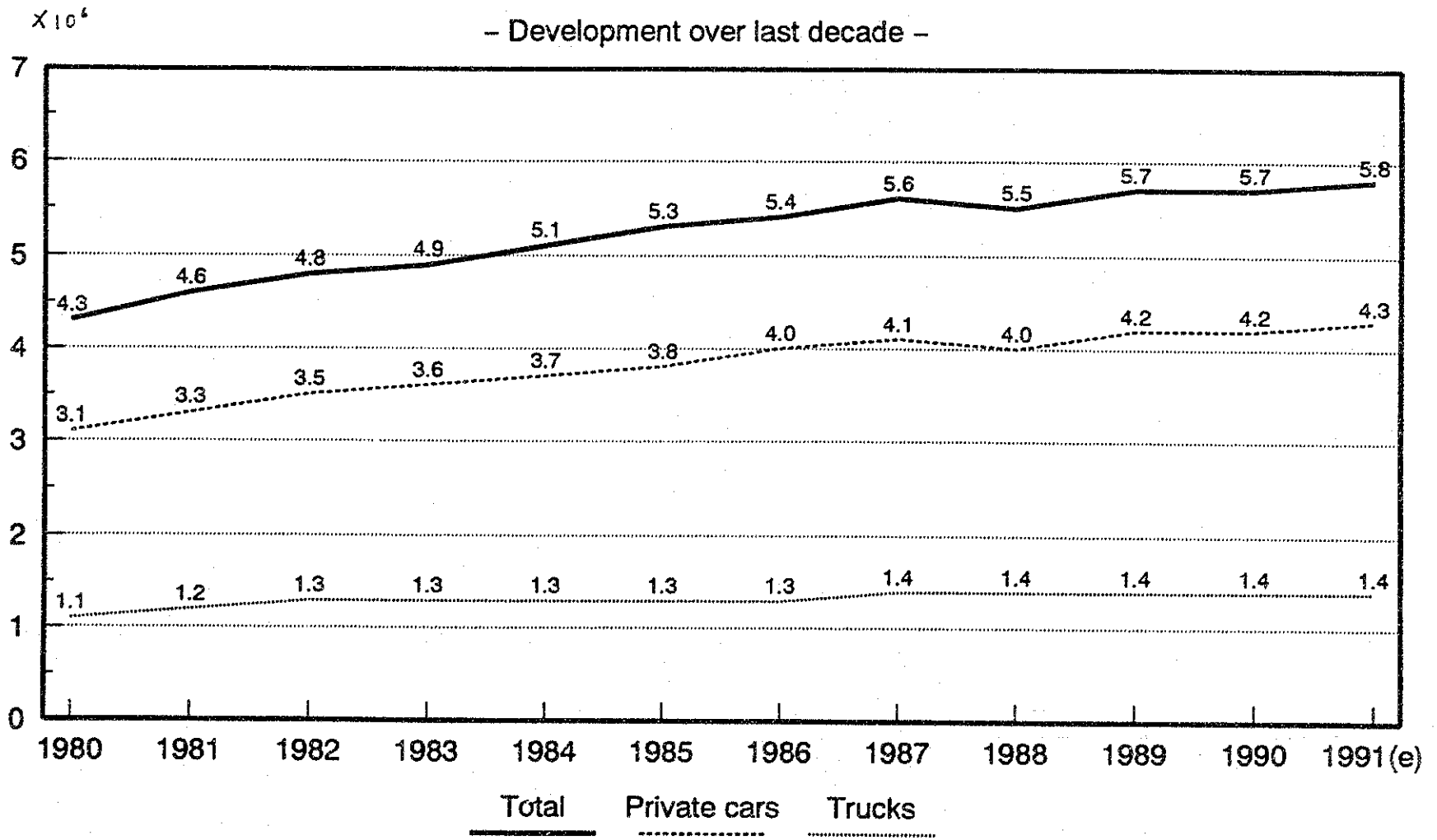


Figure 2-3-4 THE ARGENTINE CEMENT INDUSTRY



(e):Estimate

Figure 2-3-5 AUTOMOTIVE REGISTRATION

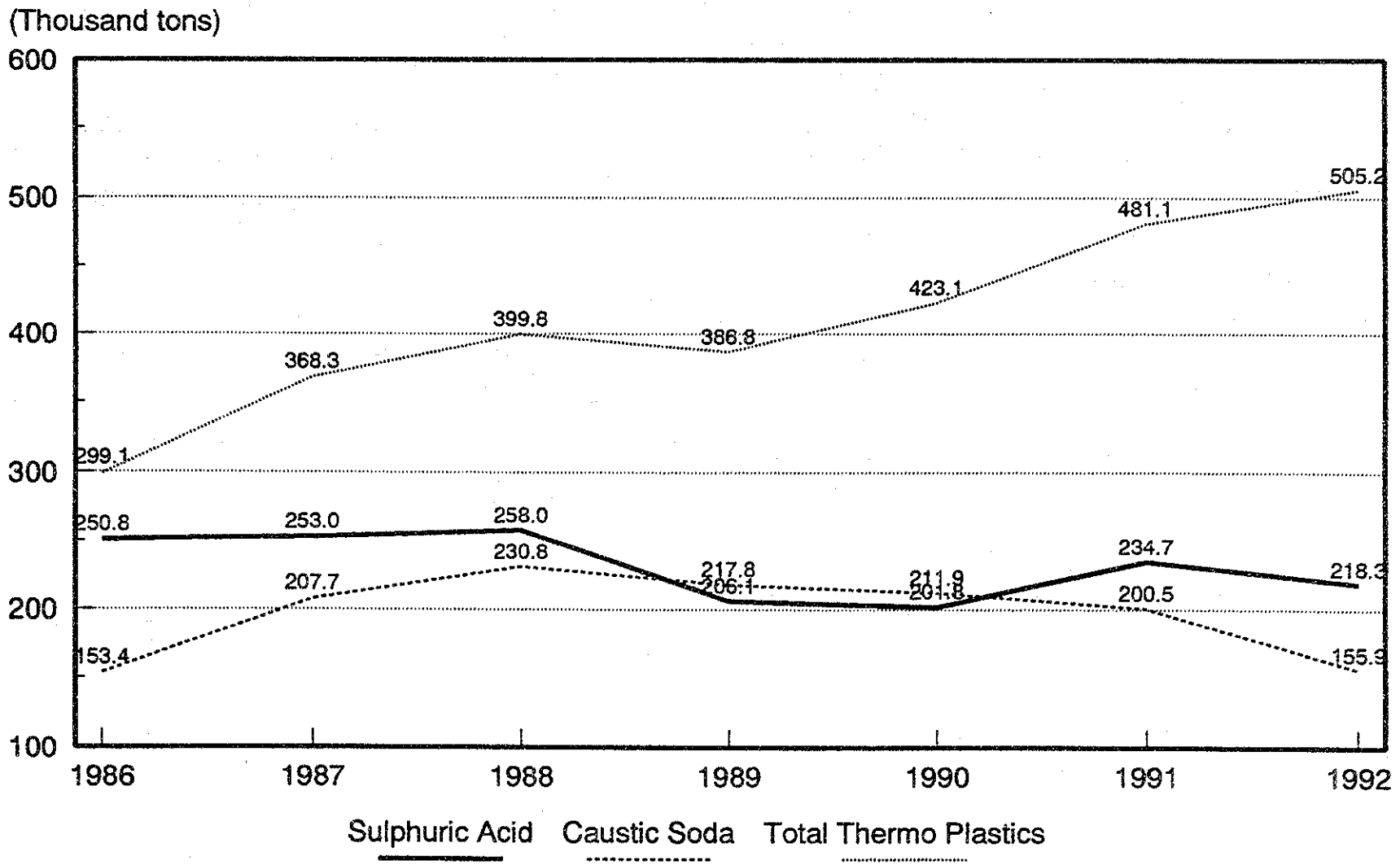


Figure 2-3-6 STATISTICS ON THE ARGENTINE CHEMICAL INDUSTRY

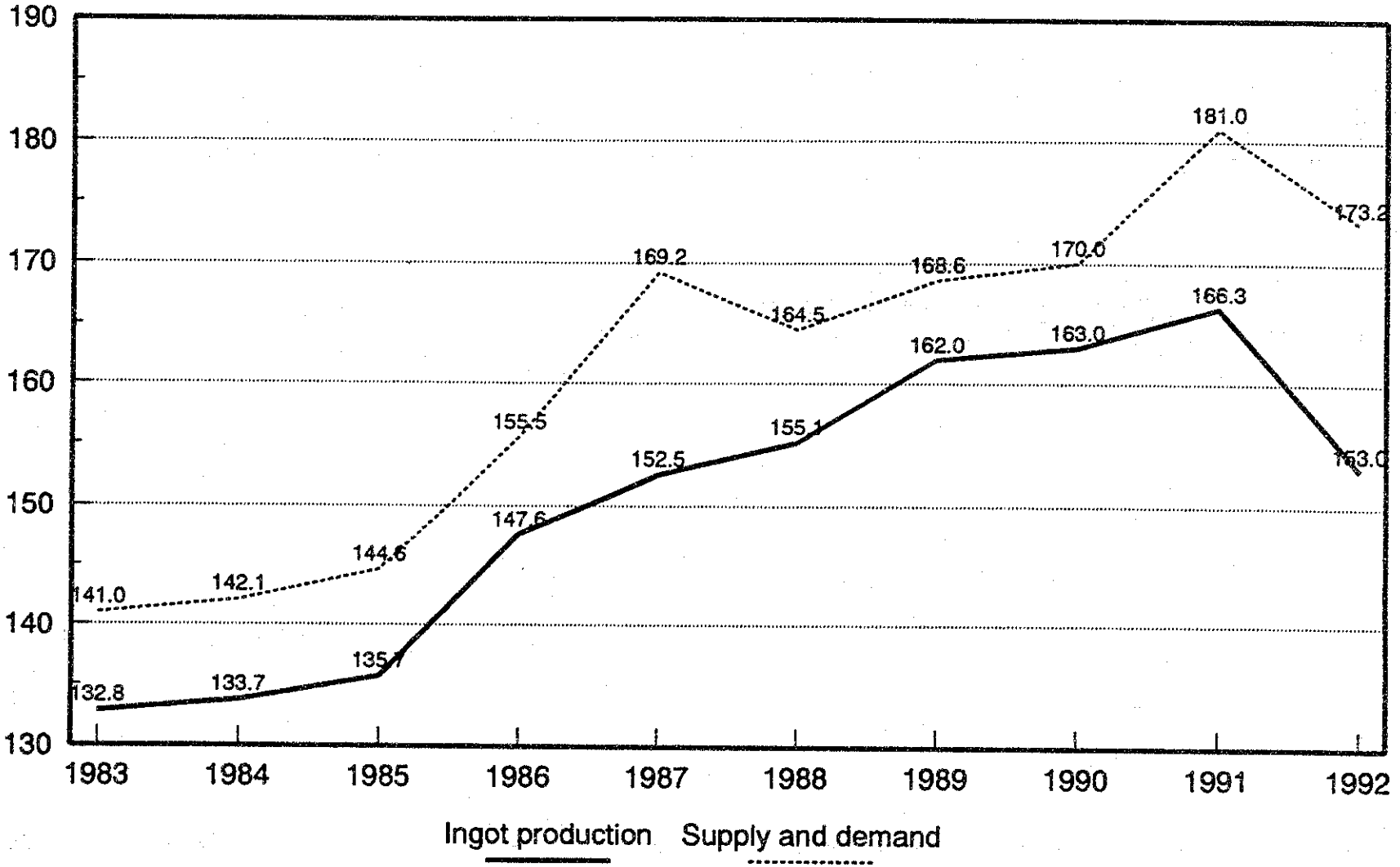


Figure 2-3-7 APPARENT CONSUMPTION OF ALUMINIUM

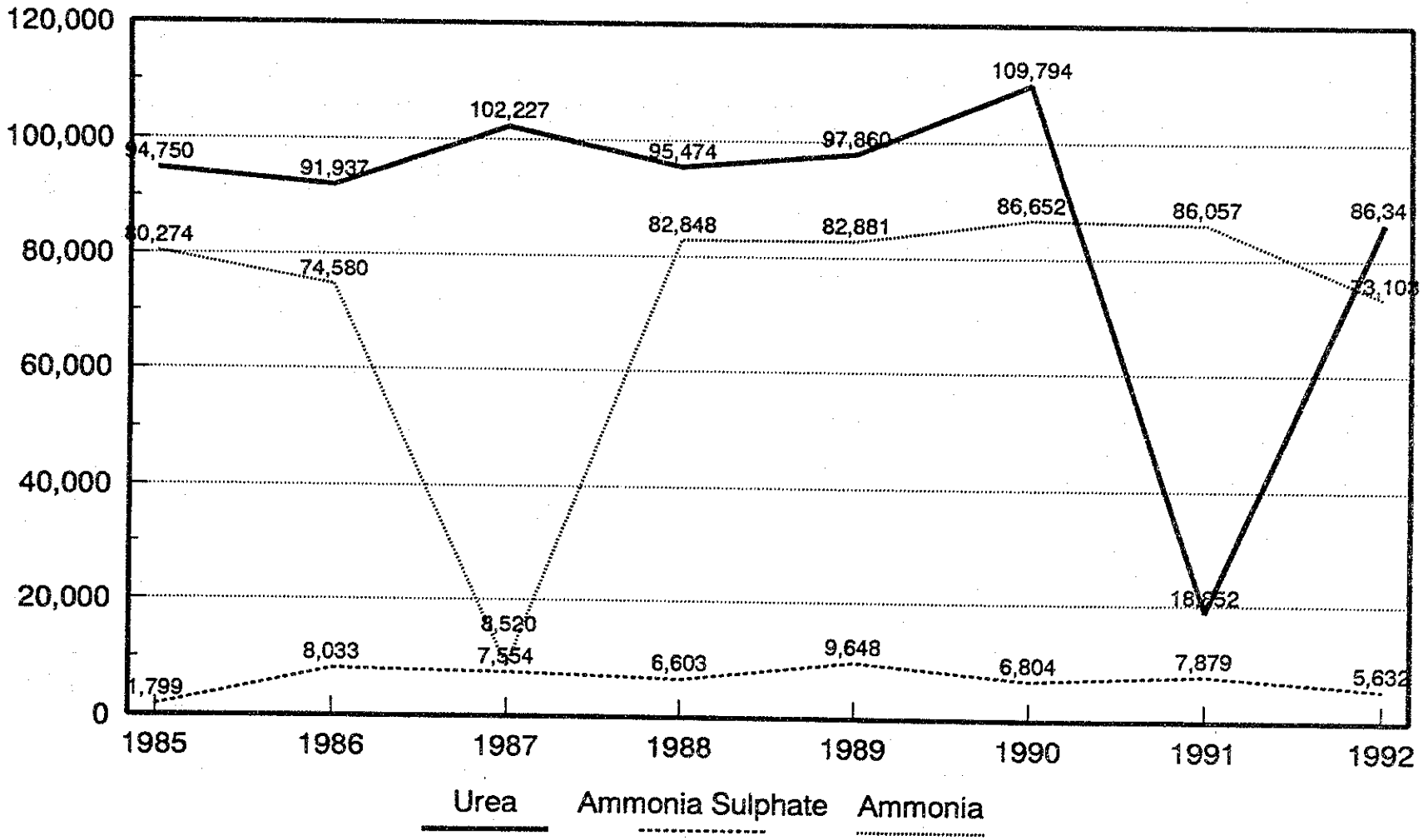


Figure 2-3-8 STATISTICS

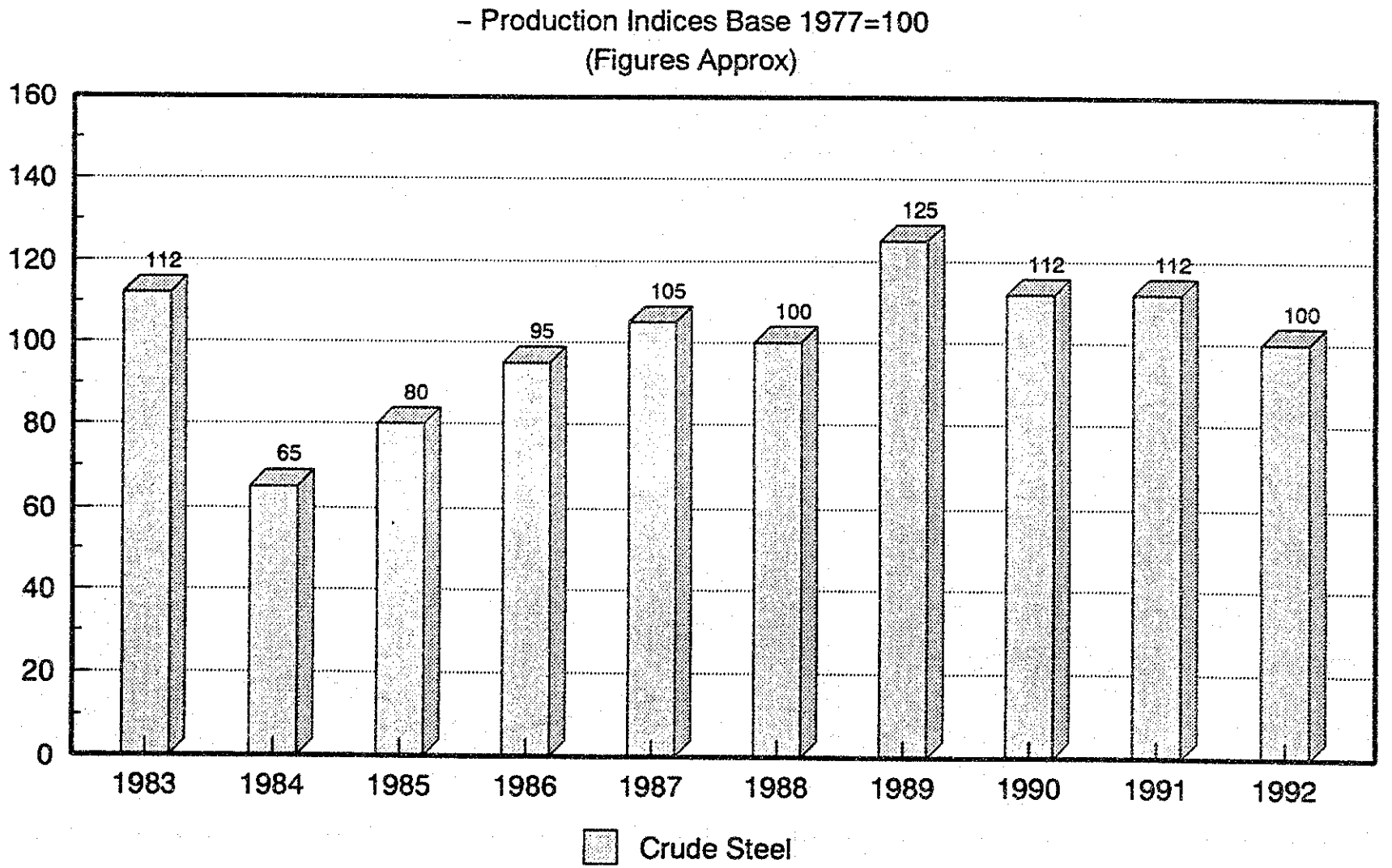


Figure 2-3-9 THE METALS INDUSTRY

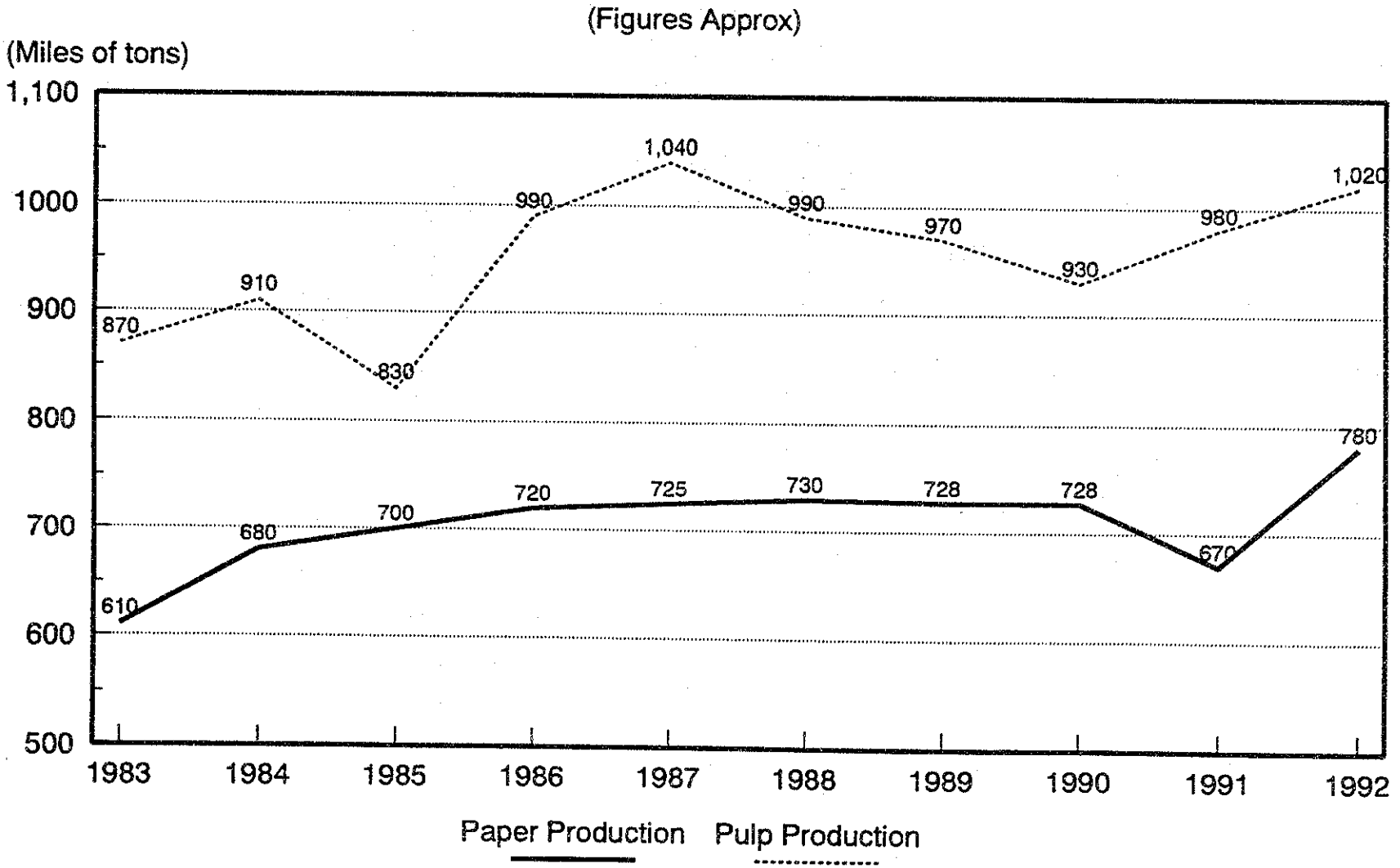


Figure 2-3-10 THE PAPER INDUSTRY

2.4 Current Condition of Power Sectors in Argentine

2.4.1 Demand of Power

(1) Trend of power demand

The trend of power demand in Argentine for recent four years is shown in Table 2-4-1 and Figure 2-4-1. The demand of power in 1991 was 39,130 GWh, and this figure shows approximately 6% increase compared with the year before.

Table 2-4-1 TREND OF POWER DEMAND

Items / Year	Power demand by a category of business				Total (GWh)	Crecim annual (%)
	Residential	Commercial	Industrial	Others		
1980	11,130	3,506	18,805	4,839	38,280	-
1985	10,579	3,280	17,533	4,658	36,050	-5.8
1990	11,265	3,142	17,779	4,766	36,952	2.5
1991	11,338	3,515	18,909	5,368	39,130	5.9

Note : Except for the private power generation, and self consumption.
Source: Refer to the document of "Secretaria de Energia"

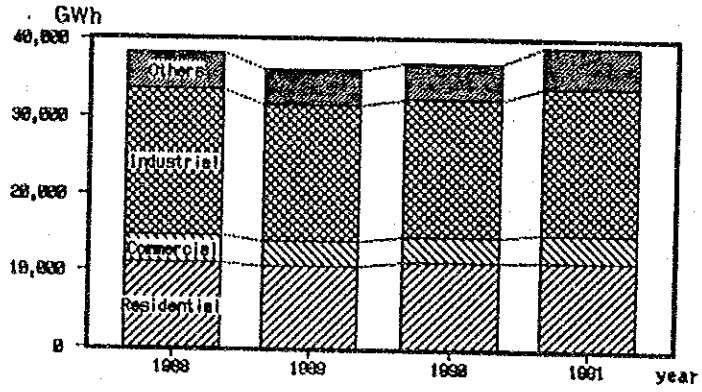


Figure 2-4-1 TREND OF POWER DEMAND

(2) Types of power demand

For the monthly change of power demand, when taking 1990 as an instance, there was some variation through the year as shown in Table 2-4-2 and Figure 2-4-2. The changes through the year is comparatively small.
As shown in Figure 2-4-3, the maximum power demand in 1990 was observed at 19:30 of 23 on July in winter season, and the power was estimated as 7,161 MW. And the minimum value of demand in the same day was approx. 3,500 MW, and it took place at 3:00. The yearly load rate is shown by the ratio between the yearly average demand (36,952*1/8,760*2=4,218 MWh) and the Max. power demand (in this case, it is set to 7,161 MW*3), and the value was approx. 59%.
The maximum daily power demand take place at nearly 22:00 in summer season, and at nearly 20:00 in winter season.

*1: Total power demand value (GWh) in 1990 on Table 2-4-2
*2: Number of hours in one year
= 24 (hours/day) x 365 (days)
= 8,760 (hours)
*3: Max. numeral in Table 2-4-2
(The numeral with mark * in July)

Table 2-4-2 MONTHLY POWER DEMAND (MAX. MIN. AND GENERATED TIME)

Month	Generation of Max. power demand			Generation of Min. power demand		
	Day	Time (*)	Power demand (MW)	Day	Time (*)	Power demand (MW)
1	26	22:30	6,645	1	08:00	3,107
2	1	22:30	6,388	11	08:00	3,139
3	14	20:30	6,375	11	08:00	3,098
4	25	20:00	6,345	29	08:00	3,117
5	29	19:30	6,975	1	08:00	2,817
6	11	19:30	7,090	18	05:00	3,435
7	23	19:30	7,049 *	15	09:00	3,255
8	31	20:30	6,898	20	08:00	3,155
9	19	20:30	6,892	20	08:00	3,241
10	10	20:30	6,645	15	07:00	3,025
11	22	22:00	6,700	4	08:00	4,233
12	5	22:00	6,664	25	09:00	3,005
Year	*: Estimated 7,161 MW		7,090			2,817

(*): Time of Buenos Aires
Source: Energia Electrica 1989/1990 (Secretaria de Energia)

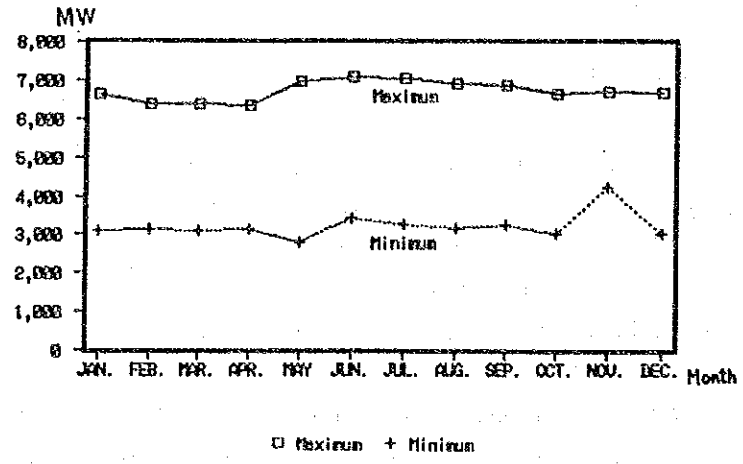
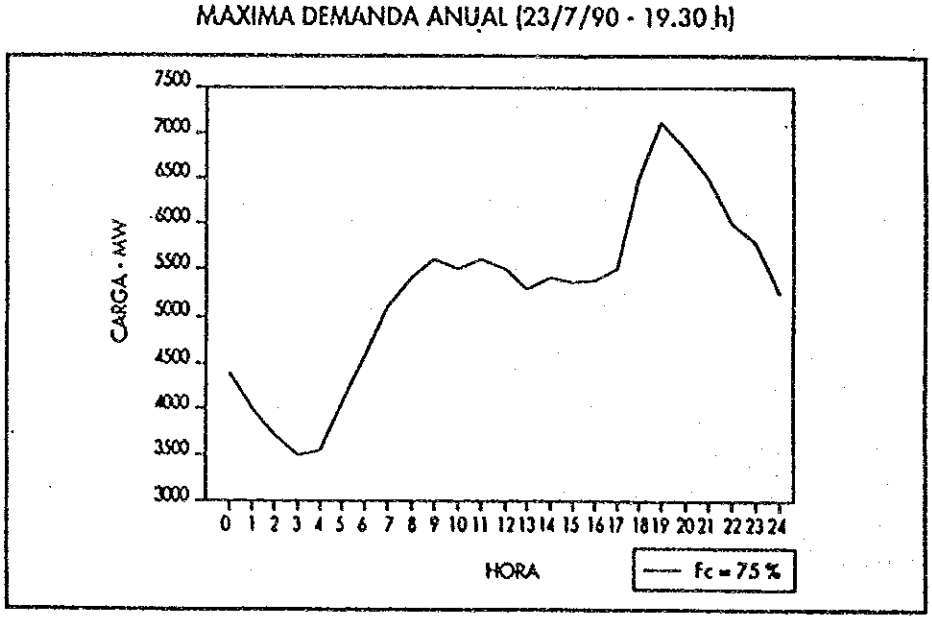


Figure 2-4-2 MONTHLY POWER DEMAND (MAX. AND MIN.)

For generation of Max. power demand, when 23, July in 1990 is taken as an instance, the daily load curve is shown in Figure 2-4-3, and the Max. power demand (7,161 MW) took place at 19:30, and Min. power demand (Approx. 3,500 MW) took place at 3:00.
The daily average power demand was approx. 5,300 MW, and the daily load rate shown the comparatively high value, approx. 75%.



Source: Energia Electrica 1989/1990 (Secretaria de Energia)

Figure 2-4-3 DAILY LOAD CURVE
(THE DAY MAY DEMAND OBSERVED IN THE YEAR)

2.4.2 Outline of Power Facilities

(1) Power system

In Argentine, large capacity hydraulic power plants are located in the northern and western area, nuclear power plants are located in the central area, and large capacity thermal power plants surround the metropolitan area.
These main power generation are connected to on the Ultra-High-Voltage transmission line of 500 kV. They are also connected to the national power supply network with the voltage levels of 330 kV, 220 kV and 132 kV.
The power systems of Argentine are also connected to those of surrounding countries, namely, the Oriental Republic of Uruguay, the Republic of Paraguay and the Republic of Bolivia.
The main power systems in Argentine are shown in the Figure 2-4-4.

(2) Past and current condition of power generation plant

The power generation system in Argentine consists of the hydraulic power generation, thermal power generation (Steam turbine, gas turbine, internal combustion engine) and the nuclear power generation, and trend of plant composition from 1980 to 1993 is shown in Table 2-4-3 and Figure 2-4-5. The power generation capacity increases to approx. 1.61 times in these 13 years, which means the average increasing rate of approx. 4% per year. In particular, the hydraulic power generation plant (approx. 1.9 times) and the nuclear power generation plant (approx. 2.8 times) have shown the great increasing rate, however, for the time, the main part of power source is the thermal power generation plant, so that the thermal power generation occupies the majority, 50.8% in total power generation facilities.

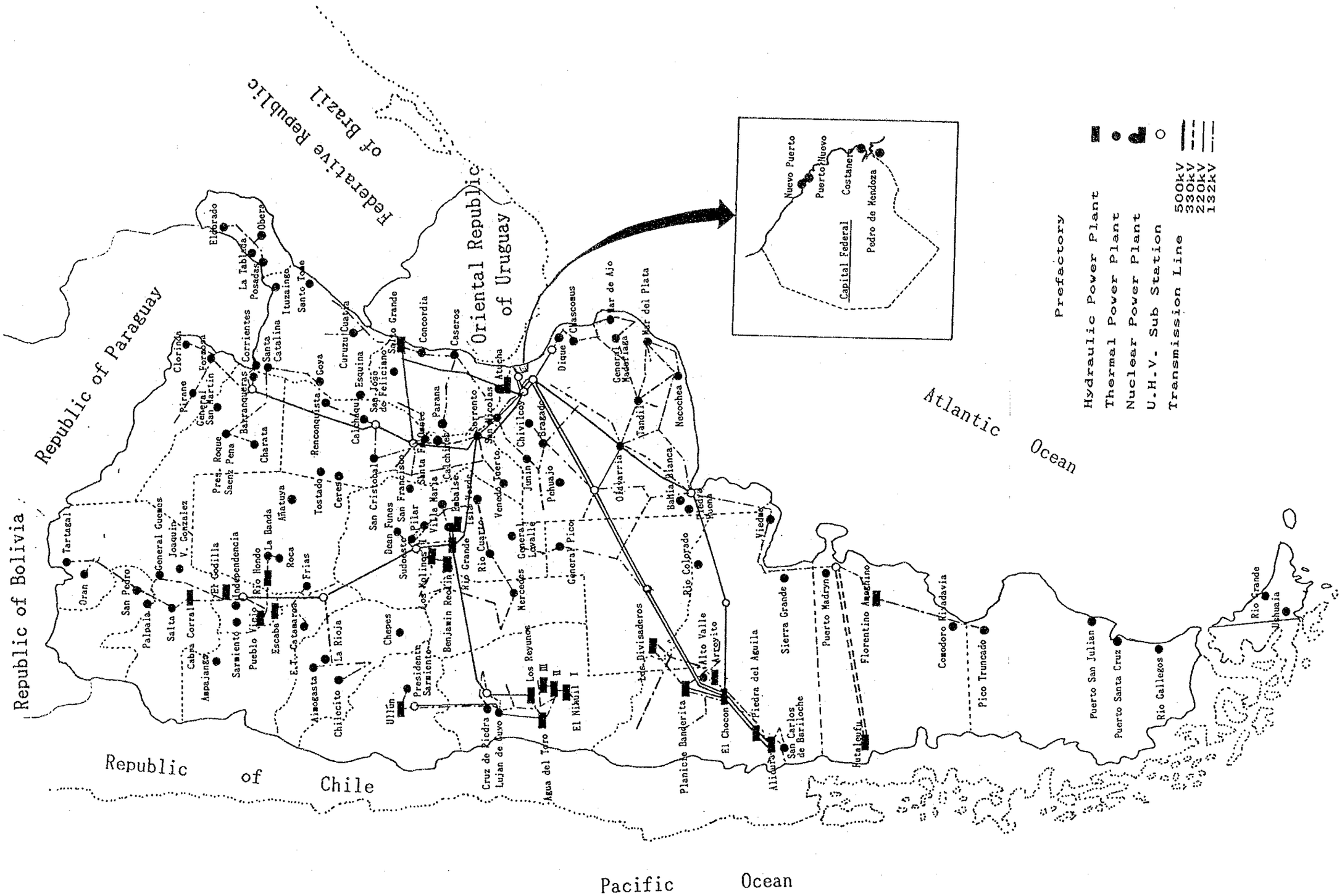


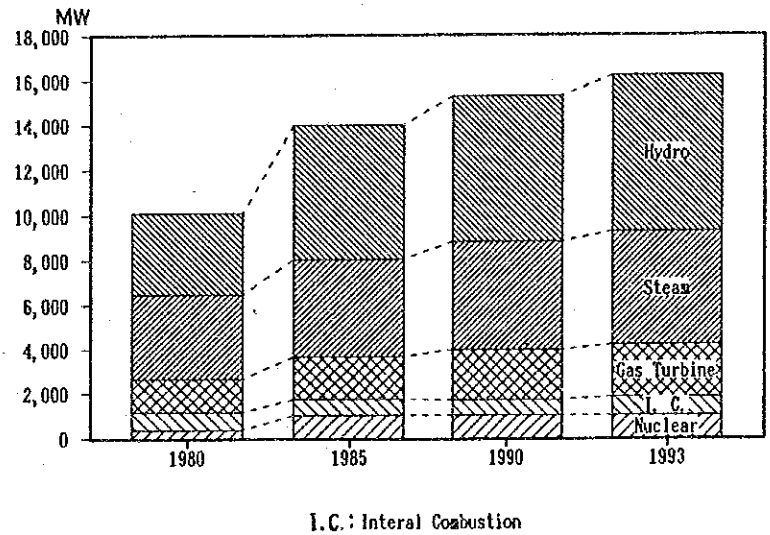
Figure 2-4-4 ELECTRIC POWER SYSTEM IN ARGENTINE

Table 2-4-3 CONFIGURATION AND CAPACITY OF POWER GENERATION PLANTS

(Unit: MW)

Items / Year	Hydraulic power generation	Thermal power generation				Nuclear power generation	Total
		Steam	Gus turbine	Internal combustion power	Total of thermal power generation		
1980	3,601	3,818	1,514	783	6,115	370	10,086
1985	5,967	4,387	1,897	725	7,009	1,020	13,996
1990	6,477	4,874	2,234	683	7,791	1,020	15,288
1993	6,970	5,070	2,355	* 820	8,245	1,020	16,235

Note: * include the combined cycle power plant (160MW)



I.C.: Interal Coabustion

Figure 2-4-5 CONFIGURATION AND CAPACITY OF POWER GENERATION PLANTS

(3) Power generation condition and annual avairability factor

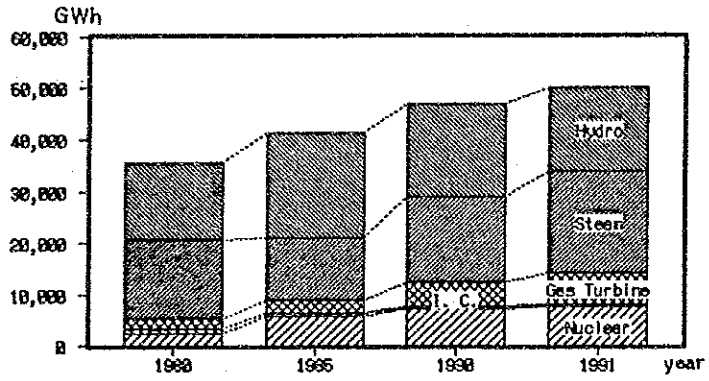
The change of electricity supply by each type of power generation from 1980 to 1991 in Argentina is shown in Table 2-4-4 and Figure 2-4-6. It shows the increase of approx. 1.41 times in these 11 years, and it is average 3.17% increasing rates as an annual percentage rate.

In 1990 and 1991, since the rainfall amount in the hydraulic power source area was extremely scarce, the electricity supply by the hydraulic power generation plant has shown the big fall, and the reduced electricity supply was supplemented by the increase of thermal and nuclear power generation.

Table 2-4-4 ELECTRICITY GENERATION BY THE TYPE OF POWER GENERATION PLANTS

(Unit: GWh)

Items / Year	Hydraulic power generation	Thermal power generation				Nuclear power generation	Total
		Steam	Gus turbine	Internal combustion power	Total of thermal power generation		
1980	15,057	15,392	1,871	1,011	18,274	2,340	35,671
1985	20,560	12,065	2,379	726	15,170	5,766	41,496
1990	18,060	16,450	4,733	483	21,666	7,281	47,007
1991	16,361	19,606	5,909	481	25,996	7,771	50,128



I.C. : Internal Combustion

Figure 2-4-6 ELECTRICITY GENERATION BY THE TYPE OF POWER PLANT

The annual availability factor by power generating plant in Argentine from 1985 to 1991 is shown in Table 2-4-5 and Figure 2-4-7.
As mentioned above, the operation rate of hydraulic power generation plant in 1991, the year of water shortage, decreased by approx. 10% compared with that of 1985, and in the thermal power generation plants, the operation rates of steam (increment of approx. 11%), gas turbine (increment of approx. 16%), and the nuclear power (increment of approx. 22%) have extremely risen.

Table 2-4-5 ANNUAL AVAILABILITY FACTOR OF POWER GENERATING PLANTS

(Unit: %)

Items / Year	Hydraulic power generation	Thermal power generation				Nuclear power generation	Total
		Steam	Gas turbine	Internal combustion power	Total of thermal power generation		
1985	39.3	31.8	14.3	11.4	24.9	64.7	34.0
1991	28.4	43.2	30.5	8.0	36.8	87.1	36.5

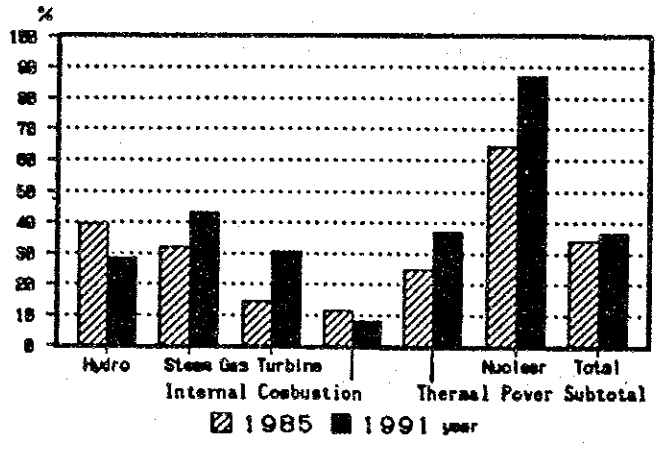


Figure 2-4-7 ANNUAL AVAILABILITY FACTOR OF POWER GENERATING EQUIPMENT

2.4.3 Summary of the Condition of Thermal Power Plant in Argentine

(1) Current condition of thermal power plant

The thermal power plants in Argentina consist of the steam, gas turbine combined cycle, and internal combustion power, and the total capacity of power plants at the end of 1993 has reached 8,245 MW.

The outline of main thermal power plants is shown in Table 2-4-6, and for the number of power plants and the number of units, the steam power plants were 21 places (67 units), the gas turbine power plants were 56 places (127 units) the combined cycle power plants 2 places (4 units), and the internal combustion power plants of more than 5 MW were 43 places (252 units).

The maximum unit capacity of thermal power plant is 350 MW of either of No. 6 unit in Costanera power plant, the steam power generator, and No. 5 unit of San Nicolas power plant.

Table 2-4-6 SUMMARY OF MAIN THERMAL POWER PLANT (1992)

(1) (End of March 1993)

Province	Power Plant	Rated Output (kW)	Unit Number	Fuel	Type
Capital Federal	Costanera	1,260,000	7	FG	STEAM
	Nuevo Puerto	420,000	3	FG	STEAM
	Pedro de Mendoza	33,000	3	F	STEAM
	Puerto Nuevo	589,000	3	FG	STEAM
	Pedro de Mendoza	50,000	3	G.GO	T. GAS
Gran Buenos Aires	Dique	152,000	8	D.G.GO	T. GAS
	Dock Sud	211,000	8	D.G	T. GAS
Buenos Aires	Bahia Blanca	50,000	2	F	STEAM
	Mar del Plata	90,000	3	F.G.	STEAM
	Necochea	206,000	4	F.G.	STEAM
	San Nicolas	670,000	5	F.G.C.	STEAM
	Piedra Buena	620,000	2	F.G.	STEAM
	Chivilcoy	19,370	5		DIESEL
	General Madariaga	5,599	4		DIESEL
	Pehuajo	6,026	4		DIESEL
	Tandil	9,452	8		DIESEL
	Bahia Blanca	32,000	2	G.GO	T. GAS
	Bragado	12,000	1	—	T. GAS
	Chascomus	3,400	1	GO	T. GAS
	Junin	16,000	1	GO	T. GAS
	Mar de Ajo	32,000	2	GO	T. GAS
	Mar del Plata	58,882	3	G.GO	T. GAS
	Olavarria	16,000	1	G.GO	T. GAS
	Pehuajo	12,000	1	GO	T. GAS
Catamarca	Ampajango	5,084	7		DEISEL
	E.T. Catamarca	18,000	1	G	T. GAS
Cordoba	Dean Funes	33,000	1	F.G.	STEAM
	Pilar	216,000	4	F.G.	STEAM
	Isla Verde	9,345	3		DEISEL
	Dean Funes	34,000	2	D.G.	T. GAS
	General Lavalle	46,000	2	D.G.	T. GAS
	Rio Cuarto	34,000	2	D.G.	T. GAS
	San Francisco	40,000	2	D	T. GAS
	Sudoeste	140,000	4	D.G.	T. GAS
	Villa Maria	51,000	3	D.G.	T. GAS
Corrientes	Esquina	5,936	8		DIESEL
	Goya	9,586	8		DIESEL
	Ituzaingo	8,268	8		DIESEL
	Santo Tome	7,450	5		DIESEL
	Corrientes	16,000	1	GO	T. GAS
	Curuzu Cuatia	2,750	1	—	T. GAS
	Goya	17,300	1	GO	T. GAS
	Ituzaingo	2,750	1	—	T. GAS
	Santa Catalina	78,200	4	GO	T. GAS
	Santo Tome	2,750	1	GO	T. GAS
Chaco	Barranqueras	45,000	4	F	STEAM
	Charata	5,592	6		DIESEL
	General San Martin	7,296	6		DIESEL
	Pres. Roque Saenz Pena	8,169	3		DIESEL
	Barranqueras	76,300	5	GO	T. GAS
	Pcia. Roque Saenz Pena	17,000	1	—	T. GAS

※ Under 5,000kW DIESEL Type are excluded

(2) (End of March 1993)

Province	Power Plant	Rated Output (kW)	Unit Number	Fuel	Type
Chubut	Comodoro Rivadavia	9,000	3		DIESEL
	Comodoro Rivadavia	131,760	6	G	T. GAS
	Puerto Madryn	45,600	2	G	T. GAS
Entre Rios	Caseros	22,400	4	F	STEAM
	Concordia	6,360	2		DIESEL
	San Jose de Feliciano	5,584	8		DIESEL
	Parana	15,400	1	GO	T. GAS
Formosa	Clorinda	8,190	9		DIESEL
	Formosa	16,000	5		DIESEL
	Pirane	7,785	8		DIESEL
	Clorinda	7,400	2	D	T. GAS
	Formosa	16,000	1	D	T. GAS
Jujuy	Palpala	35,600	2	D.G	T. GAS
	San Pedro	31,700	2	G	T. GAS
La Pampa	General Pico	17,000	1	—	T. GAS
La Rioja	Aimogasta	5,936	6		DIESEL
	Chepes	5,736	5		DIESEL
	Chilecito	13,680	7		DIESEL
	La Rioja	9,610	5		DIESEL
	La Rioja	32,000	2	G	T. GAS
Mendoza	Lujan de Cuyo	245,000	3	F.G.	STEAM
	Lujan de Cuyo (1)	31,700	1	—	STEAM
	Cruz de Piedra	36,640	2	G.GO	T. GAS
	Lujan de Cuyo (1)	108,060	4	G.GO	T. GAS
Misiones	La Tablada (2)	22,400	1	—	STEAM
	Eldorado	8,513	7		DIESEL
	Posadas	11,176	4		DIESEL
	La Tablada (2)	87,790	4	D	T. GAS
	Obera	35,200	2	D	T. GAS
Neuquen	Alto Valle	30,000	2	F.G	STEAM
	Alto Valle	67,500	3	G	T. GAS
Rio Negro	San Carlos de Bariloche	7,668	4		DIESEL
	Viedma	11,600	7		DIESEL
	Rio Colorado	7,450	2	GO	T. GAS
	San Carlos de Bariloche	10,928	4	G	T. GAS
	Sierra Grande	36,000	2	G	T. GAS
Salta	General Guemes	245,000	3	G	STEAM
	Joaguin V. Gonzalez	5,735	5		DIESEL
	Oran	9,894	6		DIESEL
	Joaquin V. Gonzalez	2,750	1	GO	T. GAS
	Oran	4,700	1	—	T. GAS
	Salta	10,500	1	—	T. GAS
	Tartagal	17,500	3	G	T. GAS
San Juan	Presidente Sarmiento	31,500	3	G	T. GAS
San Luis	Mercedes	7,780	5		DIESEL
Santa Cruz	Puerto San Julian	5,656	7		DIESEL
	Puerto Santa Cruz	5,640	4		DIESEL
	Rio Gallegos I	6,726	5		DIESEL
	Rio Gallegos II	12,800	4		DIESEL
	Pico Truncado I	43,600	4	G	T. GAS
	Pico Truncado II	21,000	2	G	T. GAS

※ Under 5,000kW DIESEL Type are excluded

(3) (End of March 1993)

Province	Power Plant	Rated Output (kW)	Unit Number	Fuel	
Santa Fe	Calchines	40,000	3	F.G	STEAM
	Sorrento	226,000	3	F.G	STEAM
	Calchaqui	5,248	4		DIESEL
	Ceres	5,866	8		DIESEL
	Reconquista	21,140	7		DIESEL
	San Cristobal	6,605	8		DIESEL
	Tostado	5,104	8		DIESEL
	Venado Tuerto	16,976	9		DIESEL
	Renconquista	4,700	1	D	T. GAS
	Santa Fe Oeste	39,000	2	GO	T. GAS
Santiago del Estero	Añatuya	5,372	7		DIESEL
	Roca	9,600	5		DIESEL
	Frias	32,000	2	G	T. GAS
	La Banda	16,000	1	G	T. GAS
Tierra del Fuego	Ushuaia	7,400	5		DIESEL
	Rio Grande	34,000	2	G	T. GAS
	Ushuaia	5,000	2	G	T. GAS
Tucuman	Independencia	80,000	5	G	STEAM
	Independencia	30,100	2	G	T. GAS
	Sarmiento	25,150	2	G.GO	T. GAS
TOTAL		7,756,913	451		

※ Under 5,000kW DIESEL Type are excluded

(2) Operation condition of thermal power plant

The capacity, electric energy of power generation and the operation rate of plants by type of thermal power generating plant in 1992 are shown in Table 2-4-7 (See Figure 2-4-8). These are almost the same operation condition as 1991.
The capacity of steam power plants, the mainstream of thermal power generating plants, occupies a little under of 2/3 of total for the capacity of power generating plant, and occupies a little over of 3/4 of total for electric energy of power generation.
For the operation plan of power system, "Companía Administradora del Mercado Mayorista Electrico S.A." (The abbreviation is CAMMESA) plans the electric energy supply by year, season, month, week, and day beforehand, and corresponding to the plan, CAMMESA gives instruction to each power plant properly to scheme the stabilized operation of power generation system.
Therefore, CAMMESA grasps the power generating capability, operation cost, inspection schedule and repair schedule of each power plant, in particular, the start characteristics of each unit, such as warm period stop or cold period stop, as a system reserve power, to make effort for most economical operation.
As a target of supply reliability, CAMMESA shall keep the variation range of system frequency to within the adequate range, and the allowable change range shall be 50±0.4 Hz, and when the frequency reduces to 49.2 Hz, CAMMESA shall restrict the load.

Table 2-4-7 THERMAL POWER PLANT CAPACITY AND OPERATIONAL CONDITION (1992) BY THE TYPE OF PLANT

Items / Types	Capacity of plant (MW)	Yearly electric power generation (GWh)	Annual availability factor (%)
Steam	5,060 (63.5)	19,900 (77.5)	44.9
Gas turbine	2,230 (28.0)	5,305 (20.6)	27.2
Internal combustion power	680 (8.5)	485 (1.9)	8.1
Total	7,970 (100.0)	25,690 (100.0)	36.8

Note : The numerals within parentheses shown the configuration ratio (%).
Source: Refer to the document of "Secretaria de Energia".

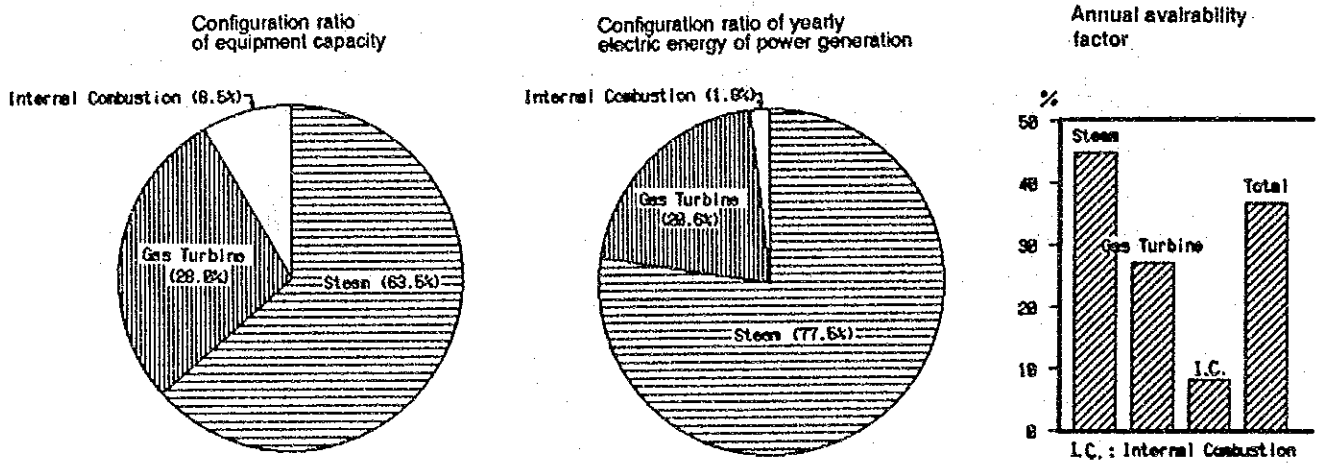


Figure 2-4-8 THERMAL POWER PLANTS AND ITS OPERATIONAL CONDITION (1992)

(3) Electric power generation by area

The electric power generation by area in 1992 is shown in Table 2-4-8 (See Figure 2-4-9).
The electric power generation in Capital Federal (Buenos Aires city) and Gran Buenos Aires, the Metropolitan area, was 9,694 GWh. This figure occupies 37.7% of total of Argentine, and the electric power generation in Buenos Aires Province was 8,057 GWh, and occupies 31.4% of total. When summing up them, it occupies approx. 67% of total. Ranking after Buenos Aires province, the electric power generation is in the sequence of 1,889 GWh (7.3%) in Cordoba province, 1,004 GWh (3.9%) in Salta province, 991 GWh (3.9%) in Mendoza province, and 841 GWh (3.3%) in Santa Fe province.

Table 2-4-8 THERMAL ELECTRIC POWER GENERATION BY AREA (1992)

(Unit: GWh)

Types / Areas	Steam	Gas turbine	Internal combustion power	Total
Capital Federal	8,601	76	0	8,677 (33.8)
Gran Buenos Aires	0	1,017	0	1,017 (4.0)
Buenos Aires	7,336	711	10	8,057 (31.4)
Catamarca	0	61	34	95 (0.4)
Cordoba	1,144	740	5	1,889 (7.4)
Corrientes	0	69	46	115 (0.4)
Chaco	75	38	4	117 (0.4)
Chubut	0	552	20	572 (2.2)
Entre Rios	0	15	3	18 (0.1)
Formosa	0	19	6	25 (0.1)
Jujuy	0	136	10	146 (0.6)
La Pampa	0	0	1	1 (0.0)
La Rioja	0	101	11	112 (0.4)
Mendoza	609	379	3	991 (3.9)
Misiones	32	103	21	156 (0.6)
Neuquen	222	116	8	346 (1.3)
Rio Negro	0	79	20	99 (0.4)
Salta	994	0	10	1,004 (3.9)
San Juan	0	89	18	107 (0.4)
San Luis	0	0	14	14 (0.1)
Santa Cruz	0	319	95	414 (1.6)
Santa Fe	612	167	62	841 (3.3)
Santiago del Estero	0	242	30	272 (1.1)
Tierra del Fuego	0	52	50	102 (0.4)
Tucuman	275	223	4	502 (2.0)
Total	19,900 (77.5)	5,304 (20.6)	485 (1.9)	25,689 (100.0)

Note : Digits within parentheses show the configuration ratio (%).
Source: Refer to the document of "Secretaria de Energia".

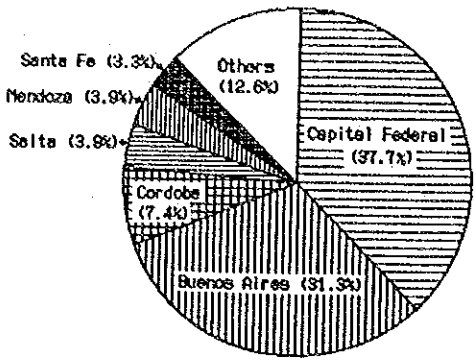


Figure 2-4-9 CONFIGURATION OF ELECTRIC ENERGY OF POWER GENERATION BY AREA (1992)

(4) Summary of fuel for power generation

(a) The situation of fuel consumption

For fuels used in the thermal power plant in Argentina, the main stream is natural gas, however, in winter, since the consumption of natural gas for general users increases the supply quantity is shortage, so that the According to the reason above, for the fuel consumption in thermal power plants, the natandural gas is most great in quantity, then other fuel are consumed in the sequence of fuel oil, gas oil, and the coal. For the coal, only No.5 unit of San Nicolas power plant uses. The fuel consumption from 1980 to 1992 is shown in Table 2-4-9 (See Figure 2-4-10).

Table 2-4-9 FUEL CONSUMPTION FOR POWER GENERATION

Fuels / Year	Coal (10^3 ton)	Fuel oil (10^3 ton)	Diesel oil (10^3 ton)	Gas oil (10^3 ton)	Natural gas ($10^6 m^3$)
1980	408	2,383	691	7	2,302
1985	223	792	469	8	3,424
1990	94	1,030	153	274	5,411
1992	241	1,478	-	492	5,688

Source: SE's data

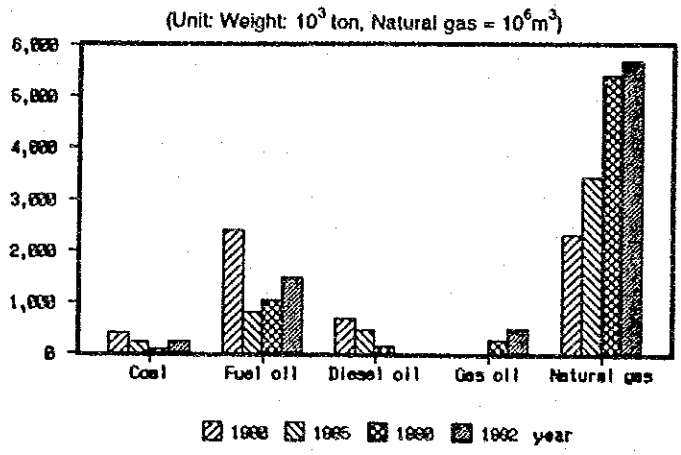


Figure 2-4-10 FUEL CONSUMPTION FOR POWER GENERATION

(b) Fuel consumption by type of power generation

The classification by type of power plant by fuel kind each in 1990 is shown in Table 2-4-10. The natural gas is used for all types, and besides natural gas, the coal and the fuel oil are used for the steam generator, and the diesel oil and the gas oil are used for the diesel engine generator and the gas turbine generator respectively.

Table 2-4-10 FUEL CONSUMPTION BY TYPE AND BY FUEL TYPE (1990)

Items / Types	Electric energy of power generation (GWh)	Weight (10^3 ton)				Natural gas (10^6 m^3)
		Coal	Fuel oil	Diesel oil	Gas oil	
Steam	16,450	93.6	1,030.3	-	-	3,596.0
Gas turbine	4,733	-	-	66.9	238.9	1,799.5
Internal combustion power	483	-	-	86.6	35.3	35.0
Total	21,666	93.6	1,030.3	153.5	274.2	5,430.5

Source: Energia Electrica 1989/1990 (Secretaria de Energia)

(c) Rate of fuel consumption

For various fuels consumed in thermal power plants in 1992, the consumption converted to a petroleum using a calorific value per each unit is shown in Table 2-4-11 (See Figure 2-4-11).

According to this table, the fuel used most often is a natural gas, and the natural gas occupies approx. 70% of total, then the fuel oil (a little over 20%), and the gas oil (7%) follow the natural gas. The consumption of coal is extremely little.

Table 2-4-11 YEARLY CONSUMPTION OF FUEL KIND IN THERMAL POWER STATION (1992)

Items / Fuels	Fuel consumption (Unit)	Converted value to petroleum (10^3 ton)
Coal	240.8 (Weight: 10^3 ton)	130.0 (1.9)
Fuel oil	1,478.0 (Weight: 10^3 ton)	1,448.4 (21.1)
Gas oil	492.4 (Weight: 10^3 ton)	512.1 (7.5)
Natural gas	5,687.5 (Volume: $10^6 m^3$)	4,777.5 (69.5)
Total		6,868.0 (100.0)

Note 1: The digits within parentheses in the column of petroleum conversion show the configuration ratio.
Note 2: The calorific values by fuel kind each used for petroleum conversion are shown below.
- Coal : 5,400 kcal/kg
- Fuel oil : 9,800 kcal/kg
- Gas oil : 10,400 kcal/kg
- Natural gas: 8,400 kcal/m^3
- Petroleum : 10,000 kcal/kg

Source: Refer to the document of "Secretaria de Energia".

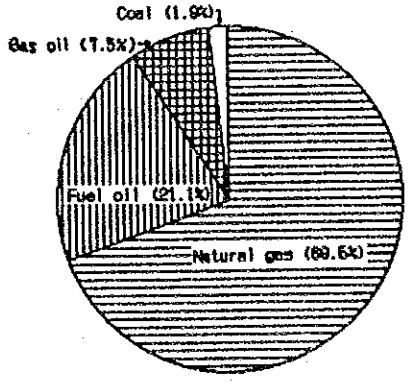


Figure 2-4-11 CONFIGURATION RATIO OF YEARLY CONSUMPTION OF FUEL IN THERMAL POWER STATIONS (EXPRESSED IN PETROLEUM EQUIVALENT)

2.4.4 Future Prospects of Electric Power Sector

As summarized below, SE has predicted demand for electricity to be needed for future economic growth and outlined its supply plan to meet the demand.

(1) Future Demand of Electricity

The electricity demand up to the year 2010 has been forecasted by way of an economic forecast model applying a regression analysis of the historical data covering the period from the third quarter of 1988 to the end of 1992 of electricity demand with respect to G.D.P. between 1993 and 2000.

The assumed economic growth rate is 6.5% between 1992 and 1995, 5.0% between 1996 and 2000, 4 % between 2000 and 2002 and 3 % between 2002 and 2010 in line with the announcement by Ministerio de Economia y Obras y Servicios Publicos titled "Argentina en Crecimiento 1993-1995 (Mayo, 1993)".

(2) supply of Electricity Required in Future

On the basis of the preceding calculation, future supply has been forecasted applying student's t-test with confidence levels of 95 % and 99% (Results of Forecast).
The electricity generation in 2010 is to be 98,738 GWh, 1.97 times of 50,128 GWh in 1991, if the 95% confidence level is applied (88,094 GWh, 1.76 times of 1991 supply on the basis of reference level). The current supply plan consists of 46,039 GWh thermal power plants (46.6%), 40,939 GWh hydro-power plants (41.5%) and 11,760 GWh nuclear power plants (11.9%).

The breakdown of electricity generation into three major energy sources (nuclear, thermal and hydro-power) as well as percentage of share of each source is provided by Table 2-4-12, Figure 2-4-12 and Figure 2-4-13 corresponding to 95% confidence interval and Table 2-4-13, Figure 2-4-14 and Figure 2-4-15 corresponding to reference level.

Table 2-4-12 SUPPLY CAPABILITY IN ARGENTINE REPUBLIC (POWER GENERATION LEVEL)

- Alternative Demand in 95% Confidence Level -

Type / Year	Nuclear		Thermal		Hydro		Total
	GWh	%	GWh	%	GWh	%	GWh
1995	6,750	10.4	35,049	53.8	23,403	35.9	65,202
2000	11,760	15.1	25,274	32.4	40,939	52.5	77,973
2005	11,760	13.3	35,644	40.3	40,939	46.3	88,343
2010	11,760	11.9	46,039	46.6	40,939	41.5	98,738

Table 2-4-13 SUPPLY CAPABILITY IN ARGENTINE REPUBLIC (POWER GENERATION LEVEL)

- Alternative Demand in Reference Level -

Type / Year	Nuclear		Thermal		Hydro		Total
	GWh	%	GWh	%	GWh	%	GWh
1995	6,750	11.0	31,166	50.8	23,403	38.2	61,319
2000	11,760	16.4	25,046	34.9	35,020	48.8	71,826
2005	11,760	14.7	27,346	34.2	40,939	51.1	80,045
2010	11,760	13.3	35,395	40.2	40,939	46.5	88,094

Figure 2-4-12 ENERGY SUPPLY OF THE WHOLE COUNTRY
- Alternative Demand in 95% Confidence Level -

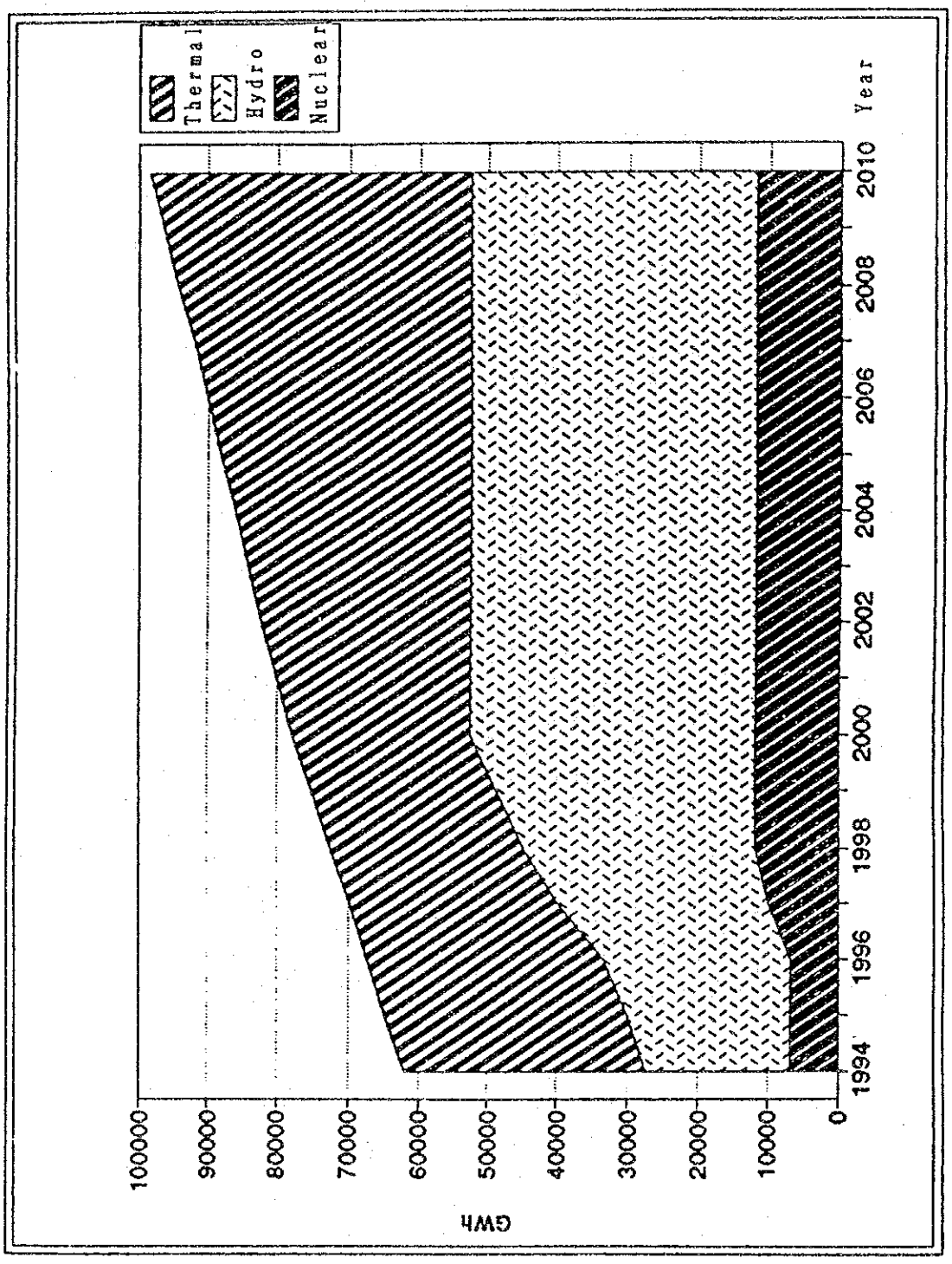


Figure 2-4-13 SUPPLY CAPABILITY OF THE WHOLE COUNTRY
- Share of Energy Sources -
- Alternative Demand in 95% Confidence Level -

Figure 2-4-14 ENERGY SUPPLY OF THE WHOLE COUNTRY
- Alternative Demand in Refernece Level -

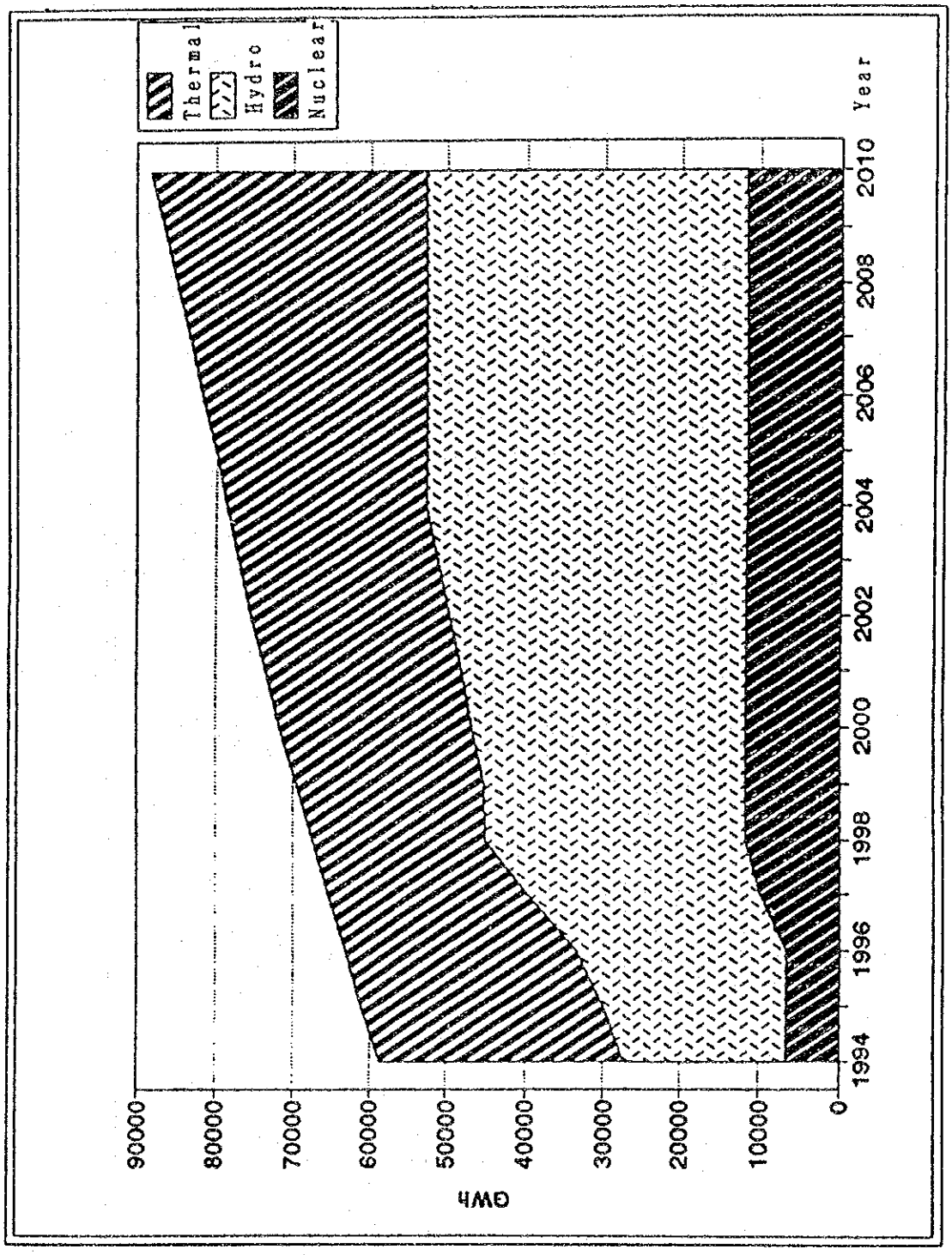
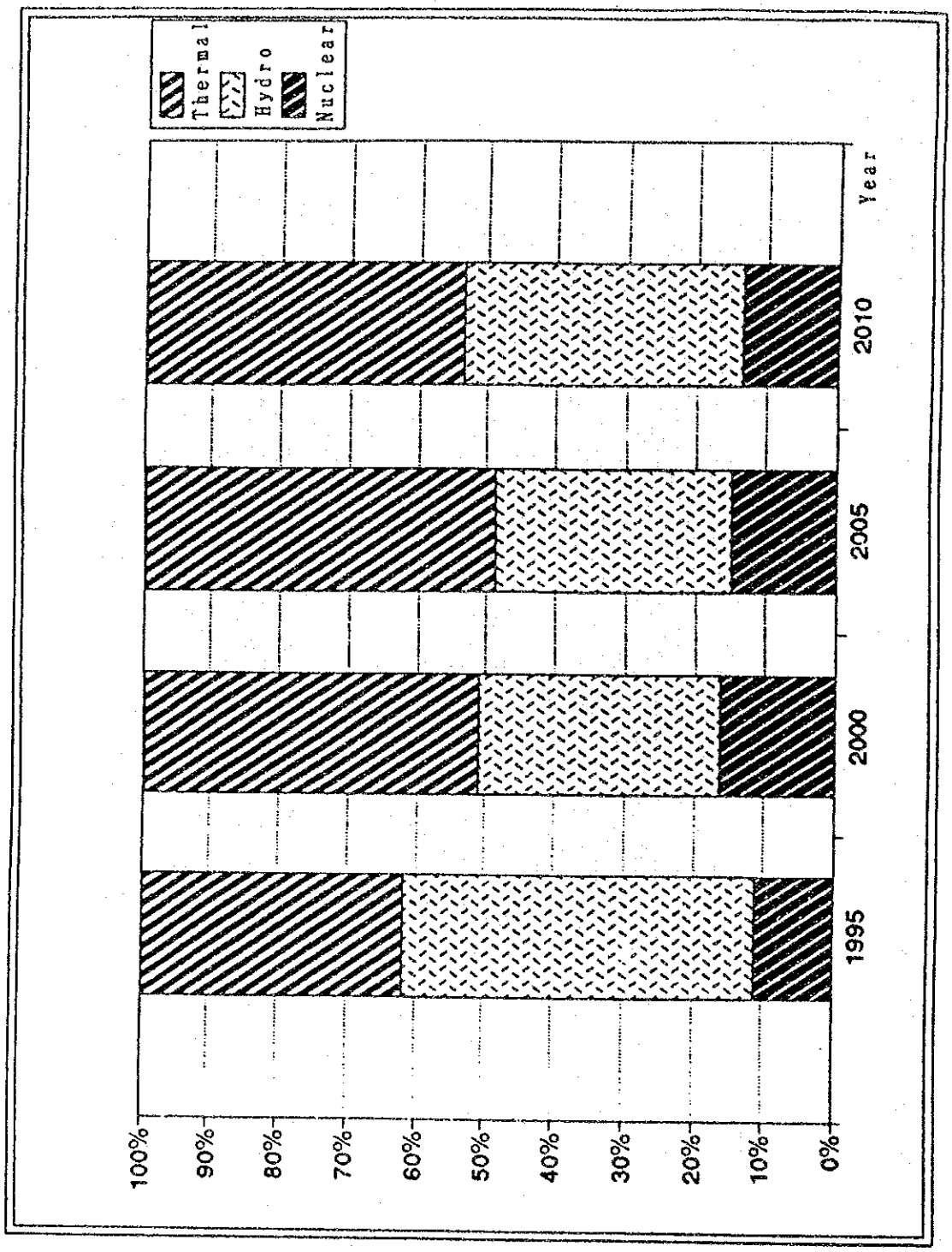


Figure 2-4-15 SUPPLY CAPABILITY OF THE WHOLE COUNTRY
- Share of Energy Sources -
- Alternative Demand in Reference Level -



(3) Supply policy for Electricity

(a) The ongoing construction of power plants are listed by Table 2-4-14, which envision start-ups by 1997 of 3608 MW consisting of 1709 MW hydro-power plants, 1154 MW thermal power (gas turbine) plants and 745 MW nuclear power plants.

Table 2-4-14 POWER DEVELOPMENT SITES UNDER CONSTRUCTION

Power Plant	Type	Output(MW)	Operation
Piedra del Aguila	Hydro	700	1993 1)
		350	7/1994
		350	12/1994
Filo Morado	Gasturbine	45	1993 1)
Agua del Cajon	Gasturbine	90	12/1993
		144	9/1994
Loma de la Lata	Gasturbine	125	5/1994
		125	6/1994
		125	7/1994
Casa de Piedra	Hydro	30	6/1994
		30	9/1994
Tucuman 2)	Gasturbine	500	1996
Pichi Picun Leufu	Hydro	83	1/1997
		83	4/1997
		83	7/1997
Atucha II	Nuclear	745	1997
yacyreta 3)	Hydro	155	9/1994
		155	11/1994
		155	1/1995
		155	4/1995
		155	6/1995
		155	9/1995
		155	11/1995
		155	1/1996
		155	4/1996
		155	6/1996
		155	8/1996
		155	11/1996
		155	1/1997
		155	4/1997
		155	6/1997
		155	8/1997
		155	11/1997
		155	1/1998
		155	3/1998
		155	6/1998

1) Under operation
2) The plan has be licensed in 1992 but not be constructed.
3) Operation with reduced level reservoir to 1998.

In addition, the Yacyreta Hydro-Power Station under construction too, plan to develop 3100MW(155MW x 20 units) from September 1994 to, by July, 1998 as Table 2-4-14 shows.
Furthermore, the power development plans in their preconstruction procedural stages include 2 thermal power plants (gas turbine) totaling 610 MW as Table 2-4-15 lists, and are expectedd to start operating in the later 1990's.

Table 2-4-15 POWER DEVELOPMENT SITES UNDER PREPARATION FOR CONSTRUCTION

Power Company	Type	Output (M/W)	Construction Point
Termo Rio. S.A.	Gasturbine	450	Comahue
Sideco S.A.	Gasturbine	160	El Bracho(NOA)

Consequently, generetors expected to start operating by 2000 will total 7,818 MW, consisting of 2,264 MW thermal plants, 4,809 MW hydro-power plants and 745 MW nuclear plants, on the other hand, electricity requirements in 2000 are predected to reach 77,973 MW at a 95% confidence interval as Table 2-4-12 shows, consisting of 25,274 thermal, 40,939 MW hydro and 11,760 MW nuclear power.

The capacity of electric power generators is expected to reach 24,053 MW, 1.5 times as large as 1993, on the basis of existing facilities and on-going projects, while the utilization ratios are predicted at 27.5% for thermal power plants, 39.7% for hydro-power plants and 76.1% for nuclear power plants.

Table 2-4-16 GENERATING CAPACITY IN 2000

Description Type	Installed Capacity (MW)			Output (GWh)	Annual Abaila-bility Factor(%)
	1993	2000	Total		
Thermal	8,245	2,264	10,509	25,274	27.5
Hydro	6,970	4,809	11,779	40,939	39.7
Nuclear	1,020	745	1,765	11,760	76.1
Total	16,235	7,818	24,053	77,973	Ref:37.0

Incidentally, of the total electricity of 40,939 GWh to be generated by hydro-power plants in 2000, the Yacyreta Station is projected to account for about 50%.

(b) Supply policy until 2000

As Table 2-4-17 demonstrates, the incremental power generation between 2000 and 2010 is planned to reach 20,765 GWh meeting demand at a 95% confidence level, all of which is planned to be met by thermal power generation.

Table 2-4-17 INCREASE OF PRODUCTION OVER 2000
- Level of Confidence at 95% -

Description Type	Forecast in 2000 (GWh)	Forecast in 2010 (GWh)	Increase (GWh)
Thermal	25,274	46,039	20,765
Hydro	40,939	40,939	0
Nuclear	11,760	11,760	0

Accordingly, thermal power plants to be needed to start operating after 2000 will be either gas turbine plants or combined cycle plants, whose fuel and operating costs are the lowest, under such circumstance, new thermal power plant totaling 3,200 MW at 75% utilization ratio as an example need to be completed by 2010, although the capacity requirements differ depending on what utilization ratio is applied, the standard elements of these estimated facilities are listed by Table 2-4-18.

Table 2-4-18 DETAILS OF FASCILITIES FOR DEVELOPMENT

Description	Unit	Combined Cycle Unit	Gasturbine Unit
Capacity	M/W	300	100 - 150
Heat Rate	kcal/kWh	2,200	2,700
Annual Abailability Factor	%	75	75
Fuel Type	-	Natural Gas	Natural Gas
Unit Price of Construction	S/kW	700	400

These expanded thermal power plants meeting future demand will be installed in the Comahue and NOA regions as Figure 2-4-16 shows, of which 70% will be located in Comahue and 30% in NOA.
These ratios may meet both with reserves and production capacity of natural gas and forecasted electricity demand of these regions, Incidentally, Comahue's demand includes that in the Bs As and Gran Bs As regions, while NOA's demand includes Centro's and Cuyo's.

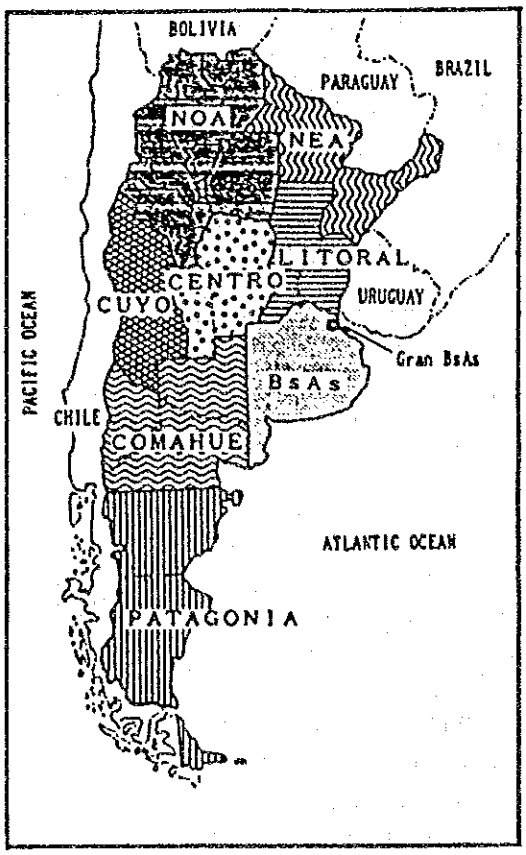


Figure 2-4-16 DIVITED AREA BY ENERGY

(c) Power Development in Future

The above discussions touch on some alternatives of the electricity supply plan designed to meet short and medium term demand forecast in future. The largest electric energy source in the country is hydro-power, which is expected to have enough potential to meet future incremental demand. Table 2-4-19 lists currently confirmed hydro-power development potential.

Table 2-4-19 CONFIRMED HYDRO POWER GENERATION RESOURCES IN ARGENTINE REPUBLIC

(GWh/Year)

System	Utilizable Hydro Resource				Potential Hydro Resource	Total
	Developed	Under Development	Under Planning	Subtotal		
Del Plata	4,475	9,715	59,825	74,015	17,055	91,070
Del Atlantico	10,215	7,105	35,190	52,510	19,450	71,960
Del Pacifico	3,000	0	1,280	4,280	3,040	7,320
Mediterraneo	550	0	390	940	640	1,580
Total	18,240	16,820	96,685	131,745	40,185	171,930

2.4.5 Government's Privatization Policy for Power Sector

(1) Structure of power sectors after privatization

Before the privatization, the power supply plants in Argentina were divided into the central government managed enterprise and the provincial government managed enterprise (See Table 2-4-20). They were under the control of the Power Agency (SE; Secretaria de Energia) in the Economy and Public Enterprise Ministry and other government organizations together with power transmission, transformation, and distribution system.

Table 2-4-20 CONSTITUTION OF POWER SECTORS BEFORE PRIVATIZATION

(As of 1991)

Jurisdiction	Enterprise	Possessed equipments (MW)				
		Hydraulic power	Thermal power	Gus turbine	Nuclear energy	Total
Power agency	AyEE: Government managed hydraulic power company (Power generated quantity in 1991: 14,357 GWh)	2,096	1,742	1,019	-	4,857
	SEGBA: Gran Buenos Aires power company (Power generated quantity in 1991: 10,488 GWh)	-	2,304	400	-	2,704
	EPEC: Cordoba power company (Power generated quantity in 1991: 2,266 GWh)	178	264	345	-	787
	ESEBA: Buenos Aires province power company (Power generated quantity in 1991: 3,953 GWh)	-	1,031	182	-	1,213
	HIDRONOR: North Patagonia power company (Power generated quantity in 1991: 5,911 GWh)	2,770	-	-	-	2,770
Presidential office	CNEA: Public corporation of nuclear power (Power generated quantity in 1991: 7,771 GWh)	-	-	-	1,018	1,018
The Department of Foreign Affairs	CTMSG: Technical committee between two countries, Salto Grande (Power generated quantity in 1991: 3,970 GWh)	1,260	-	-	-	1,260
	Other power companies: Province management, Cooperative society (Power generated quantity in 1991: 1,407 GWh)	282	516	262	-	1,060
Total		6,586	5,857	2,208	1,018	15,669

*: Including diesel

(2) Current Status of Privatization of Electric Power Sector

The Argentine has been promoting drastic economic reforms since the late 1980's; particularly, national enterprises in such sectors as transportation, communication, municipal water supply,sewage, steel and oil are being privatized. Concerning the electric power sector, the Energy Agency of Ministerio de Economia y Obras y Servicios Publicos has been privatizing thermal power plants and transmission - transformation - distribution facilities based on the same principle with other sectors. Already in April, 1992, the Central Puerto S.A. was established as the first privatized power generation company incorporating among others, the Nuevo Puerto thermal power plant (420MW) belonging to the former SEGBA and Puerto Nuevo thermal power plant (589MW). Many other organizations in the sector have also been privatized and all the rest, which used to be national enterprises, are due to be privatized as 1994 as Table 2-4-21 shows.

Table 2-4-21 POWER EQUIPMENTS OF EACH ENTERPRISE (1993)

Enterprize	Steam Turbine (MW)	Combined Cycle (MW)	Gas Turbine (MW)	Int. Combustion (MW)	Nuclear (MW)	Hydro (MW)	Total (MW)
Privatized power company 1)	3,598		1,370	8		3,594	8,570
Government power plant privatized in 1994	285	90	179	51		2,086	2,691
Technical committee between two countries						945	945
CNEA					1,020		1,020
Province, Munincipal, 2) cooperation	1,187	71	805	601		344	3,009
Total	5,070	160	2,355	660	1,020	6,970	16,235

Remarks: 1) at December 31, 1993
2) include transfer from government power plant

By 1993, the power generating facilities listed in Table 2-4-22 were privatized. They consist of 3,598 MW steam turbine generators, 1,370 MW gas turbine generators, 8 MW diesel engine generators and 3,594 MW hydro-power generators, which are being managed by 21 power companies including 16 companies managing thermal power generators.

Table 2-4-22 EQUIPMENTS OF EACH POWER COMPANY PRIVATIZED BY 1993

Region	Power Companies	Steam Turbine (MW)	Gas Turbine (MW)	Int. Combustion (MW)	Hydro (MW)	Total (MW)
Gran Buenos Aires	C.Costanera	1,260 FG				1,260
	C.Puerto	1,009 FG				1,009
	P.Mendoza	33 FG	61G.GO			94
	Dique		127G.GO			127
	Dock Sud		210G.GO			210
Buenos Aires	C.San Nicolas	670CFG				670
Litoral	C.Sorrento	226 FG				226
Centro	EDESAL			8 GO	4	12
Comahue	C.Alto Valle	30 G	67 G			97
	Agua del Cajon		90 G			90
	Filo Morado		46 G			46
NOA	C.NOA	80 FG	216G.GO			296
	C.Guemes	245 G				245
NEA	C.NEA	45 F	203 GO			248
Patagonica	C.Patagonica		258 G			258
	Aluar		92 G			92
Comahue	Alicura				1,000	1,000
	Peidra del Aguila				700	700
	El Chocon				1,320	1,320
	Planicie Banderita				450	450
NEA	Urugual				120	120
Total		3,598	1,370	8	3,594	8,570

Remarks: at December 31, 1993

Furthermore, the generators facilities listed by Table 2-4-23 are due to be privatized in 1994. They consist of 285 MW steam turbine generators, 179 MW gas turbine generators, 90 MW co-generators, 51 MW diesel engine generators and 2,086 MW hydro-power generators, which will be managed by 12 power companies including 5 companies managing thermal power generators.

Table 2-4-23 GOVERNMENT POWER PLANT PRIVATIZED IN 1994

Region	Power Companies	Steam Turbine (MW)	Combind Cycle (MW)	Gas Turbine (MW)	Int.Combustion (MW)	Hydro (MW)	Total (MW)
Litoral	C.Litoral	40 FG		54G.GO			94
Centro	Rio.Grande					750	750
Cuyo	C.Cuyo	245 FG	90G.GO	87G.GO			422
	C.San Juan			31G.GO	GO	45	76
	Diamante					368	368
	Nihuiles					259	259
NOA	C.Corral					102	102
	C.Santiago del Estero				18 GO	17	35
	H.Tucuman					50	50
NEA	C.Formosa			7	33		40
Patagonica	Futaleufu					448	448
	Florentino Ameghino					47	47
Total		285	90	179	51	2,086	2,691

(3) SE's policy regarding private management of thermal power plant

The Energy Agency (SE: Secretaria de Energia) supervises the operation of power facilities in Argentina under the control of Economy and Public Enterprise Ministry.
SE's status in the government organization is shown in Figure 2-4-17.

(a) Basic policy for the privatization

For the privatization of thermal power plant, SE performs comprehensive judgment and evaluation, that is, the judgment for technical ability of offered private enterprise, namely, if the private enterprise has the operation experience for the power plant of more than 2,000 MW in the past, and the judgment of management ability, namely, the content, scale, etc. of future investment plan for the currently operating plant.

Also, in principle, to avoid monopoly of power system by one private party, the power generating capacity that one enterprise can possess is limited to be less than 10% of whole power generating plant capacity in Argentina.

(b) Basic policy on environment protection measure

With the progress of privatization of thermal power plants, SE impose the following requirements to the power companies conforming to the revised regulations of the environment protection manual (Resolution S.E. No. 149/90) of thermal power plant in order to maintain the condition of atmospheric environment. Regulations regarding air pollution control will be detailed in the next chapter.

1) The power company shall submit the preliminary environmental written diagnosis which assess the impact that the flue gas and the drain exhausted or discharged from the power plant influence the environment within six months after establishment of private management.

2) The power company shall install the automatic measuring instruments of SO_x, NO_x for flue gas and the measuring instruments of dust within six months after establishment of private management.

3) The power company shall install the automatic measuring instruments of pH for rain within three months after establishment of private management, together with deciding the drain points which become the control objects of pH.

4) For SO_2 and the dust in the flue gas, the power company shall observe the exhaust standard determined newly by the establishment of private management.

5) Laws and regulation for drain, noise, and vibration shall be observed.

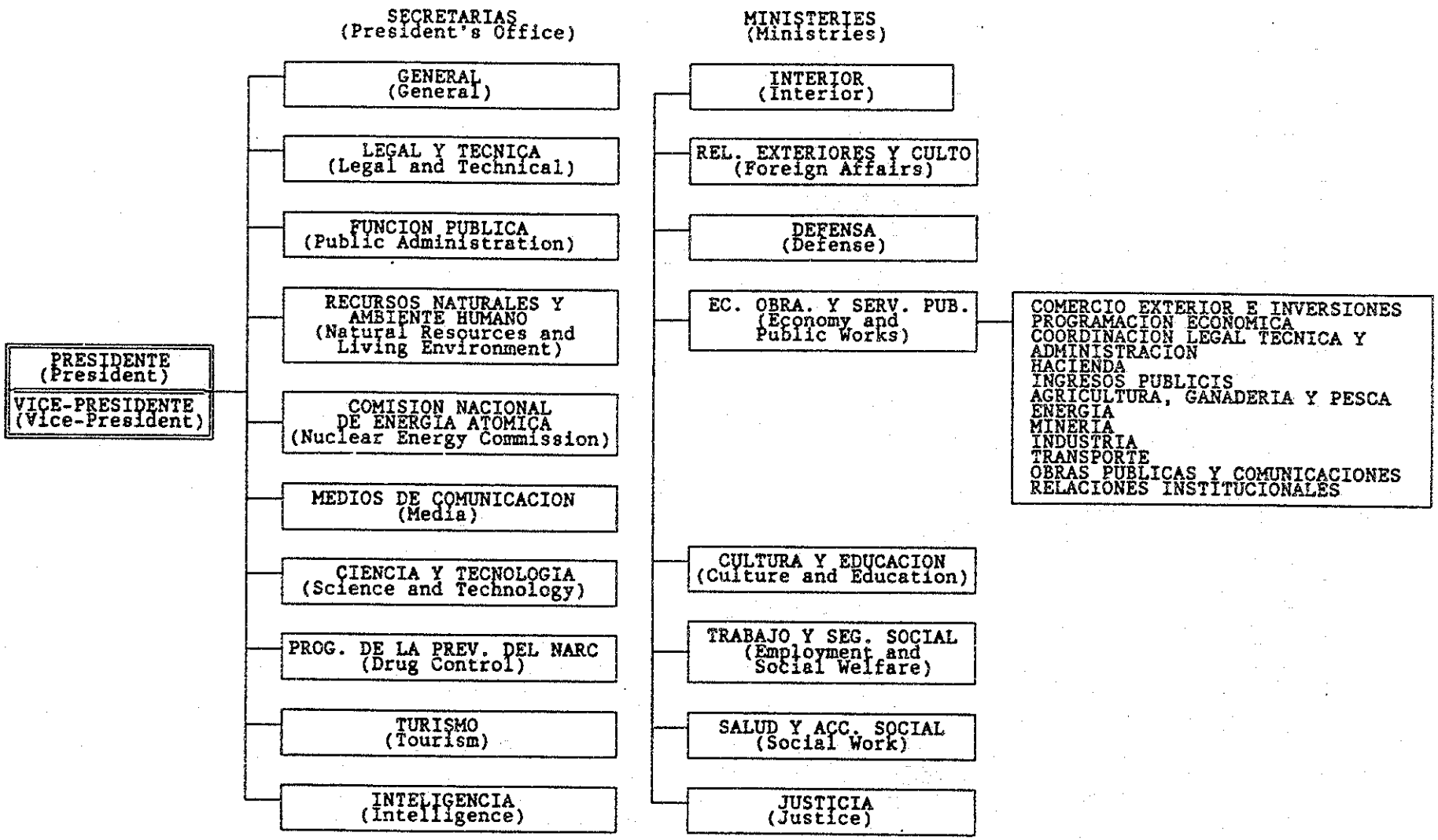


Figure 2-4-17 GOVERNMENT ORGANIZATION CHART OF ARGENTINE REPUBLIC

2.5 Governmental Policy Related to Air Pollution Preventive Measure

2.5.1 Standard to Control the Air Pollution

In 1973, the government of Argentine enacted the regulations (Derecto) 4858/73 "Preservacion del Medio Ambiente" to keep the proper level for whole general environments in Argentina. And for the atmospheric environment, the standard for maintenance of atmospheric environment has been determined in the same 1973, by the law (Ley) 20284/73 "Preservacion de los Recursos de Aire".

(1) Country's law for maintenance of atmospheric environment (Ley 20284/73)
This law determined the following items:
- The power company shall report the all generating sources having a possibility of air pollution.
- For the country, provinces, and Bs As city (Buenos Aires city), the supervision authority shall be given in each jurisdiction area.
- When the discharge from the contamination source spreads over the complex jurisdiction areas, the committee among the jurisdiction areas shall perform the control and operation.

In addition, the law determined the regulations related to the concentration of contaminants and air pollution levels, together with determining the discharged or exhaust approved limits to the contaminants discharged or exhausted from the various fixed generating sources and moving generating sources to the regions, to oblige the publication.

In particular, for the concentration of contaminants, the law determined four levels of "Normal, Watch, Alert, Danger", also determined the penalty regulations together with giving an authority related to restrictions and inhibitions of operations and activities in the contaminated areas, as required.

Regulations related to the concentration by each concentration level are shown in Table 2-5-1, and the analytical methods of

each contaminants are shown in Table 2-5-2.

The section in charge of control for current atmospheric environment as a whole in Argentine government is determined as Governmental Board of Health by the law (Ley 20284/73). This corresponds to the current Natural Resources Life Environment Ministry (Secretaria de Recursos Naturales y Ambiente Humano).

Table 2-5-1 AIR POLLUTION CONTROL STANDARDS IN ARGENTINE

Concentration level / Items	Normal		Watch		Alert		Danger	
	Concentration	(Hour)	Concentration	(Hour)	Concentration	(Hour)	Concentration	(Hour)
CO	10 50	8 1	15 100	8 1	30 120	8 1	50 150	8 1
NO_x	0.45	1	0.6 0.15	1 24	1.2 0.3	1 24	0.4	24
SO_x	0.03 70*	Monthly average	1 0.3	1 8	5	1	10	1
O_3 and general oxidant	0.10	1	0.15	1	0.25	1	0.40	1
Suspended matter	150*	Monthly average	Not applied		Not applied		Not applied	
Settled dust	1.0**	30 days	Not applied		Not applied		Not applied	

Note: The unit of concentration is ppm, however, the mark * shows $\mu g/m^3$, and the mark ** shows mg/m^3

CO : 10 mg/m^3 = 8 ppm

NO_x: 10 mg/m^3 = 5 ppm

SO_x: 10 mg/m^3 = 3.8 ppm

Table 2-5-2 ANALYTICAL METHODS OF CONTAMINANTS

Contaminants	Sampling	Analytica methods
CO		[Judgment] for continuation of CO in air using the corrected infrared ray analytica device of Jacobs, M.B. and other corrected infrared ray analytical devices. Air Pollution Control Association Journal 9:110 (1959)
NO_x	Absorption to semi-fluid substance	Saltzman method. Saltzman B.E. [Judgment of NO_2 in the air using the colorimeter] Anal. Chem. 26:1949, (1954)
SO_x	Absorption of gas to semi-fluid substance	Correction of Pate by West-Gaeke method, West P.E/ and gaeke, G.C. [Fixing of SO_2 as Mercury disulfide, and the subsequent evaluation^{2}using the colorimeter] Anal. Chem. 28:1816, (1956) Pate, J.B. [Interference of nitride using the spectrum luminosity measuring technique for SO_2 in air] Anal. Chem. 37:942, (1965)
Ozon and oxidant	Absorption of gas to semi-fluid substance	Neutral potassium iodide [Selection of method for measurement of contaminants in air] Interbranch Chemical Advisory Committee. PHS, Publication No. 999-AP 11 Cincinatti, Ohio, 1965 PD-1
Suspended matter	Filtration using high volume pump	Mass spectrometry [Analysis of suspended matter] Network 1957-61, PHS, Publication No. 978, Washington DC.
Settled dust	Extraction during collection	Mass spectrometry [Standard method for continuous analysis of settled dust] APM-1 Revision 1) Air Pollution Measurement Committee Air Pollutions Control Association 16:372 (1966)

(2) Legal regulations in local governments

(a) Buenos Aires city

Bs As city determined the environmental contamination prevention rule "Ordenanza Municipal 39025/83" conforming to the governmental law (Ley 20284/73). For the air pollution level according to the air pollutants as shown in Table 2-5-3, regulation values are determined respectively for short-term (CAPC) and long term (CAPL). In these values, the regulation value for lead whose regulation is not determined by the government.
The section in charge of control for current atmospheric environment in Bs As city is "Environmental Sanitation Department in General Environmental Policy Control Division" (Direccion General de Politica y Control Ambiental Direccion de Higiene Ambiental).

Table 2-5-3 AIR POLLUTION CONTROL STANDARDS OF BS AS CITY

Items \ Concentration level	Standard	
	Short-term	Long-term
CO	15 mg/m^3	3 mg/m^3
NO_x	0.4 mg/m^3	0.1 mg/m^3
SO_x	0.5 mg/m^3	0.07 mg/m^3
O_3 and general oxidant	0.1 mg/m^3	0.03 mg/m^3
Suspended matter	0.500 mg/m^3	0.150 mg/m^3
Settled dust	1.0 mg/m^2	30 days
Lead	0.01 mg/m^3	0.001 mg/m^3

CO : 10 mg/m^3 = 8 ppm
NO_x : 10 mg/m^3 = 5 ppm
SO_x : 10 mg/m^3 = 3.8 ppm

(b) Mendoza province

Mendoza province determined the atmospheric environmental pollution prevention law "Ley 5100/86" conforming to the governmental law (Ley 20284/73) in the same way as Bs As city.
For the air pollution level due to the air pollutants, as shown in Table 2-5-4, the regulation values are determined by hourly quantity and concentration. In these values, the regulation values for lead and hydrocarbon whose regulation values are not determined by the government are added.
The section in charge of current atmospheric environment in Mendoza province is "Environmental Control Division / Urban Planning / Housing Ministry (Ministerio de Medio Ambiente Urbanismo y Vivienda, Dirección de Control Ambiental)".

Table 2-5-4 AIR POLLUTION CONTROL STANDARDS IN MENDOZA PROVINCE

Concentration level / Items	Watch			
	Concentration $\mu g/m^3$	Hours	Concentration ppm	Hours
CO	10 * 40 *	8 hours 1 hour	9 36	8 hours 1 hour
NO_x	100 200	1 year 24 hours	0.05 0.10	1 year 24 hours
SO_x	80 260	8 hours 1 hour	0.03 0.1	8 hours 1 hour
O_3 and general oxidant	125	1 hour	0.06	1 hour
Suspended matter	100 260	30 days 24 hours		
Settled dust	1000 $\mu g/m^2$	30 days		
Lead	10	30 days		
Hydrocarbon (Except for CH_4)	0.19	3 hours		
Hydrocarbon (Total H/C)	160	3 hours		

Note: The mark * shows mg/m^3
CO : 10 mg/m^3 = 8 ppm
NO_x: 10 mg/m^3 = 5 ppm
SO_x: 10 mg/m^3 = 3.8 ppm

2.5.2 Air Pollution Control Condition

(1) General Situation

As mentioned above, the section in charge of general atmospheric environment in Argentina is the Natural Resource Life Environmental Ministry (Secretaria de Recursos Naturales y Ambiente Humano), and it's central role is correspondence related to water contamination which is the serious problem for the present.
For current air pollution condition, when judged from the activity condition of industry and economy or the fuel characteristic used, it is judged that the influence giving the atmospheric environment due to the flue gas exhausted from the fixed generation source is not significant except for the limited cases, however, for automobiles and the other moving generation sources, the influence is becoming obvious in the overpopulated areas such as Bs As city, Mendoza city, Rosario city, etc.
For power sectors, the control and operation related to the practical control of atmospheric environment, for example, enactment of discharge standards or execution of measurement for discharge sources, etc. are schemed, and these subjects are written in Chapter 3.

(2) Air pollution and control condition in Bs As city

As mentioned earlier, the Environment Sanitation Department in General Environment Policy Division (Dirección General de Políticaly Control Ambiental, Dirección de Higiene Ambiental) is in charge of controlling atmospheric environment of Bs As city. The Laboratory of Atmosphere Vigilance (Laboratorio de Vigilancia Atmosferica) undertakes actual works. The following summarizes their activity.
In Bs As city, the air environmental data forcusing vehicle emission had been measured since 1964.
In the later half in 1970s, the fixed 12 plants were installed in the city, to measure SO_2, NO_2, suspended matters, settled dust and CO regularly, and measured the lead, ozone, aldehyde, etc. occasionary. The measurement

are conducted basicaly by chemical analysis.
After that, accompanied by reformation of administrative organ, the work scale is reduced, and personnel has become five at present from 35 persons at that time, also the measurement condition after August, 1993 is shown below:

- Daily measurement = Items: NO, NO_2, SO_2
  (Measuring points: Palermo district)
- Monthly measurement = Items: Particle type contaminants
  (Measuring points: Representative 8 places in the city)
- Occasionaly measurement = Items: Lead, suspended matter, all oxidants
  (Measuring points: Representative 4 places in the city)

Note: Because of the failure of measuring instrument, CO did not measure after 1983.

The Laboratory of Atmosphere Vigilance comments about the measured data as follows:

- The yearly average value of all contaminants of measuring object is less than the standard determined in Ord, 39025/83.
- The yearly average value of SO_2 extremely lowers the standard value (0.5 mg/m^3) and 80% of measured values is less than 0.02 mg/m^3.
- NO, NO_2 show a gentle increasing trend, however, the yearly average value is less than the standard value (0.4 mg/m^3), and 80% of measured value is less than 0.24 mg/m^3. However, it is said that 3 to 4 times per year exceed the standard value.

Figure 2-5-1 to 2-5-2 show the monthly measured results for SO_2 and NO_x after 1988.

Sulfur Dioxide (SO2)

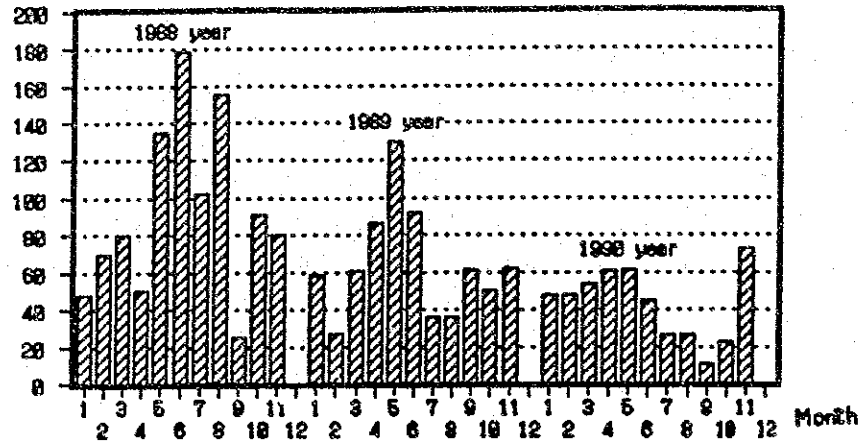


Figure 2-5-1 MONTHLY MEASURED RESULTS OF SO_2 (μg/m3)(BUENOS AIRES CITY)

Nitrogen Oxides (NOx)

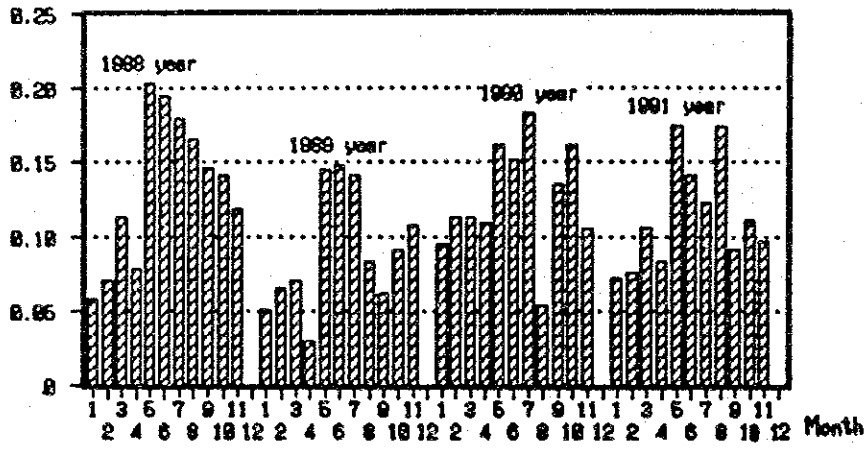


Figure 2-5-2 MONTHLY MEASURED RESULTS OF NO_x (mg/m3)(BUENOS AIRES CITY)