MEXICO

MEXICO[1]

1. ENERGY, ECONOMIC AND ELECTRICITY INFORMATION

1.1 General Overview

Mexico is located in the southern part of the North American continent. In the north it has a common boundary with the United Sates, in the south with Guatemala and Belize, to the east lies the Gulf of Mexico and the Caribbean sea, and to the west the Pacific Ocean. Its extreme latitudes are 32°43'N in the north and 14°33'N in the south. Its extreme longitudes are 86°46' West of Greenwich in the east and 117°08' West of Greenwich in the west. The total surface of Mexico is 1,958,200 km^2.

Two main features have to be taken into account regarding the climate of Mexico, in the first place the existence of two mountain ranges, one following the pacific coast and the other the Gulf of Mexico coast with a high plateau between the two ranges and, in the second place, the fact that the country is divided into two by the Tropic of Cancer. In a very broad sense, the climate south of the Tropic of Cancer is warm with an average temperature around 22°C, when the altitude above sea level is below 1,000m, and the climate is temperate with an average temperature around 15°C, above 1,000m where the altitude prevails, with a broad daily oscillation. North of the Tropic of Cancer the climate is warm during the summer and cold during the winter, with occasional snowfalls. The four traditional seasons are only felt in some parts in the north of the country. The rest divides the year in two periods: the rainy season, that goes from April to September and the dry season embracing the rest of the year.

The Laguna Verde Nuclear Power Plant is located in the coast of the Gulf of Mexico at a latitude of 19°43'30" North and a longitude of 96°23'15" West. The climate is warm and humid, with rain during the summer and with little precipitation during winter. The annual average humidity is 80%, during the year the temperature oscillates between a minimum of 8°C and a maximum of 39°C. The prevailing winds, especially during summer, blow from the Northeast; during winter the site is affected by winds coming from the north with velocities between 70 and 90 km. per hour. The seawater, which is used as cooling water, has an average annual temperature of 26°C, with a maximum during summer of 32°C and a minimum in winter of 21°C.

In 1993, the Mexican population reached almost 90 millions inhabitants (see Table 1) and it was estimated to grow with 1.6 million in absolute terms in 1994. The population growth rate in 1993 was 2 per cent and the population density 46 inhabitants per square kilometre.

1 The profile has been updated by the Secretariat, mainly by replacing the statistical information in the Tables with EEDB and arranging contents according to the revised table of contents.

TABLE 1. POPULATION INFORMATION

	1970	1980	1990	2000	2001	2002	Growth rate (%/yr) 1990 To 2002
Population (millions)	50.6	67.6	83.2	98.9	100.5	102.0	1.7
Population density (inhabitants/km²)	25.8	34.5	42.5	50.5	51.3	52.1	

Predicted population growth rate (%) 2002 to 2010	10.7
Area (1000 km²)	1958.2
Urban population in 2002 as percent of total	74.8

Source: IAEA Energy and Economic Database.

1.1.1. Economic Indicators

The total Gross Domestic Product (GDP) in 1999 was 346 billion constant 1990 US$ and its annual growth rate over the last 5 years was about 5 per cent (Table 2).

TABLE 2. GROSS DOMESTIC PRODUCT (GDP)

	1980	1990	2000	2001	2002	Growth rate (%/yr) 1990 To 2002
GDP (millions of current US$)	207,660	262,710	573,924	606,177	638,497	7.7
GDP (millions of constant 1990 US$)	219,640	262,710	370,762	369,650	372,977	3
GDP per capita (current US$/capita)	3,073	3,157	5,801	6,034	6,262	5.9

Source: IAEA Energy and Economic Database.

1.1.2. Energy Situation

Mexico has abundant oil, gas, coal and hydro resources (Table 3). The total proven reserves of hydrocarbons amount to 63,220 millions barrels, equivalent to 48 years of the present production. Mexico is not only energy self sufficient, but is also a net exporter of energy.

TABLE 3. ESTIMATED ENERGY RESERVES

	Estimated energy reserves in (Exajoule)					
	Solid	**Liquid**	**Gas**	**Uranium (1)**	**Hydro (2)**	**Total**
Total amount in place	23.82	162.96	30.48	0.93	14.85	233.03

(1) This total represents essentially recoverable reserves.

(2) For comparison purposes a rough attempt is made to convert hydro capacity to energy by multiplying the gross theoretical annual capability (World Energy Council - 2002) by a factor of 10.

Source: IAEA Energy and Economic Database.

Mexico depends heavily on hydrocarbons, during 1993 the primary energy production came 72.3% from crude oil and condensates, 17.4% from natural gas, 4.4% from biomass, 3.1% from hydro, 1.5% from coal, 0.7% from geothermal fields and 0.6% from nuclear energy. Roughly half of the crude oil production is exported and half used to satisfy the internal needs. Discounting the energy

resources exported, which are mainly oil and a little bit of coal and electricity, and taking into account the energy resources imported, consisting of some hydrocarbon products and some coal, the internal energy offer is divided in the following way: 56.7% crude oil and condensates, 26.4% natural gas, 7.0% biomass, 4.9% hydro, 3.0% coal, 1.1% geothermal energy and 0.9% nuclear energy. Some of this energy goes directly into final consumption, this is the case of biomass, about 10% goes into non energy uses and the rest is transformed into electricity and secondary energy products as gasoline, fuel oil, etc.

The final energy consumption in 1993 was divided in the following way: 39.9% in transportation, 33.7% in industry, 23.8% in commercial and residential uses and 2.6% in agriculture. Table 4 shows the historical energy statistics.

1.2. Energy Policy

The government's energy policy is based on four main strategies:

- Structural reform of the sector, in order to promote competitiveness and the diversification of primary energy sources;
- Modernization of public utilities, to improve efficiency in operation, support a results-oriented administration that guarantees profitability over the long-term and include new technologies;
- Environmental Protection, through a fuel policy that ensures a long term sustainable energy supply, compatible with Mexican environmental protection regulations, and
- Conservation, through the implementation of programmes that promote the rational and efficient use of energy.

Specific actions that have been implemented to achieve this include the production of less contaminant fuels, like unleaded gasoline and sulphur free diesel, and the diversification of primary energy sources, since the country relies too heavily on hydrocarbons.

Diversification has been promoted especially in the electricity sector, with the inclusion of geothermal energy, nuclear energy, some solar energy in rural areas isolated from the electrical grid and recently with the addition of some wind energy.

TABLE 4. ENERGY STATISTICS(*)

	1970	1980	1990	2000	2001	2002	Average annual growth rate (%) 1970 To 1990	Average annual growth rate (%) 1990 To 2002
Energy consumption								
- Total (1)	1.73	3.94	4.98	6.93	7.08	7.14	5.43	3.04
- Solids (2)	0.17	0.23	0.26	0.40	0.37	0.37	2.00	3.22
- Liquids	0.99	2.60	3.46	4.44	4.53	4.54	6.44	2.30
- Gases	0.42	0.93	0.97	1.64	1.70	1.73	4.30	4.89
- Primary electricity (3)	0.15	0.18	0.29	0.46	0.47	0.49	3.51	4.44
Energy production								
- Total	1.74	5.89	7.77	10.20	10.45	10.65	7.78	2.66
- Solids	0.16	0.19	0.25	0.34	0.35	0.37	2.36	3.13
- Liquids	0.98	4.48	6.26	7.86	7.99	8.07	9.70	2.15
- Gases	0.45	1.04	0.96	1.55	1.64	1.73	3.82	5.07
- Primary electricity (3)	0.14	0.17	0.30	0.45	0.46	0.48	3.79	3.91
Net import (Import - Export)								
- Total	-0.07	-1.93	-2.74	-3.05	-2.92	-2.75	19.71	0.02
- Solids	0.01	0.03	0.01	0.08	0.09	0.11	-2.35	24.27
- Liquids	-0.06	-1.85	-2.76	-3.20	-3.12	-2.99	21.55	0.65
- Gases	-0.03	-0.11	0.02	0.08	0.11	0.13	3.05	18.57

(1) Energy consumption = Primary energy consumption + Net import (Import - Export) of secondary energy.

(2) Solid fuels include coal, lignite and commercial wood.

(3) Primary electricity = Hydro + Geothermal + Nuclear + Wind.

(*) Energy values are in Exajoule except where indicated.

Source: IAEA Energy and Economic Database.

1.3. The Electricity System

1.3.1. Structure of the Electricity Sector

Due to historical reasons the electric service is provided by two governmental organizations: Central Light and Power, which serves Mexico City metropolitan area and some parts of the states of Mexico, Morelos, Hidalgo, Puebla and Tlaxcala; and the Federal Electricity Commission (CFE) which serves the rest of the country.

Almost all the generation is provided by CFE, Central Light and Power generates only a small fraction of its requirements. The peninsula of Baja California has two small independent systems, the northern one is interconnected to the United States. The rest of the country is served by an integrated system, which is controlled by CFE.

Only about 6.5% of the total generation of the country is provided by some private industries for their own consumption. In the past the generation and distribution of electricity has, by law, rested in the hands of the government, however, recent law modifications allow the generation of electricity by the private sector and promote the use of cogeneration.

1.3.2. Policy and Decision Making Process

Energy policy and, specifically, electricity industry policy, is the responsibility of the Ministry of Energy. Policy for the electricity industry is published in a document called "Electricity sector outlook", a 10 year programme revised annually that incorporates analyses of present electricity demand and supply, the projected evolution of national and regional demand, the proposed expansion plan for generation, transmission and distribution capacity and the estimation of required investments. The elaboration of this programme is coordinated by the Ministry of Energy and done with the help of a multidisciplinary group formed by the federal electricity commission (CFE), the central power and

light company (LFC), the Mexican petroleum company (PEMEX), the energy regulatory commission (CRE), the electricity research institute (IIE) and the national commission for energy efficiency and savings (CONAE).

Electricity demand is expected to grow at a rate of 6.1% annually for the 10-year period starting in 1999, requiring for the same period an additional capacity of 22,248 MW. This expansion rate, the largest in the country's history, will represent an opportunity for private investment. Due to a lack of public funds in the last few years, a large part of the added capacity has been possible through private investment IPP and BLT schemes, and this participation is likely to continue in the future. Transmission and distribution will continue to be the responsibility of the government.

Most of the future generation capacity is expected to be based on gas fired, combined cycle type plants due to their cleaner emissions, lower investment costs, shorter construction periods and higher thermal efficiency compared to other conventional fossil fuelled plants.

1.3.3. Main Indicators

From 1980 to 2000 the electricity generation has grown 5.8 % annually on the average, going from 66,950 GW·h in 1980 to 207,040 GW·h in 2000 (Table 5). At the end of 2000 the total installed generating capacity was 50,250 MW(e) of which 74.7% was thermal, 21.7% hydro, 1.5% geothermal and 2.7% nuclear. For the same year, the total electricity generation was 207,040 GW·h, 82.2% coming from thermal energy, 11.4% from hydro, 2.6% from geothermal and 3.8% from nuclear. The corresponding average load factors were: for thermal plants 52%, for hydro 25% and for nuclear 66%. Table 6 shows the energy related ratios from EEDB.

TABLE 5. ELECTRICITY PRODUCTION AND INSTALLED CAPACITY

							Average annual growth rate (%)	
	1970	1980	1990	2000	2001	2002	1970 To 1990	1990 To 2002
Electricity production (TW.h)								
- Total (1)	28.71	66.95	122.45	228.57	238.31	242.45	7.52	5.86
- Thermal	13.70	49.13	90.84	181.61	190.17	192.39	9.92	6.45
- Hydro	15.01	16.91	23.54	33.13	34.07	34.62	2.28	3.27
- Nuclear			2.94	7.92	8.11	9.35		10.13
- Geothermal		0.92	5.12	5.90	5.95	6.08	53.28	1.43
Capacity of electrical plants (GWe)								
- Total	7.32	16.99	28.48	45.64	46.01	46.08	7.03	4.09
- Thermal	3.98	10.77	19.23	33.83	34.28	34.34	8.19	4.95
- Hydro	3.33	6.06	7.88	9.69	9.61	9.62	4.40	1.68
- Nuclear			0.68	1.36	1.36	1.36		5.95
- Geothermal		0.15	0.70	0.75	0.75	0.75	29.46	0.61
- Wind				0.01	0.01	0.01		

(1) Electricity losses are not deducted.

(*) Energy values are in Exajoule except where indicated.

Source: IAEA Energy and Economic Database.

TABLE 6. ENERGY RELATED RATIOS

	1970	1980	1990	2000	2001	2002
Energy consumption per capita (GJ/capita)	34	58	60	70	71	70
Electricity per capita (kW.h/capita)	570	999	1,384	2,216	2,217	2,265
Electricity production/Energy production (%)	16	11	15	22	22	22
Nuclear/Total electricity (%)			2	3	3	4
Ratio of external dependency (%) (1)	-4	-49	-55	-44	-41	-38
Load factor of electricity plants						
- Total (%)	45	45	49	57	59	60
- Thermal	39	52	54	61	63	64
- Hydro	51	32	34	39	40	41
- Nuclear			49	66	68	79

(1) Net import / Total energy consumption.

Source: IAEA Energy and Economic Database.

2. NUCLEAR POWER SITUATION

Mexico is energy self sufficient, not only that, but it is also a net exporter of energy, however it is highly dependent on hydrocarbons, almost all the energy exported is in the form of crude oil and about 90% of the energy used in the country comes from oil and gas, only about 5% comes from hydro. In order to alleviate this situation, Mexico has recently incorporated other forms of energy like geothermal, coal and, from 1990 on, also nuclear energy.

2.1. Historical Development and current nuclear power organizational structure[1]

2.1.1. Overview

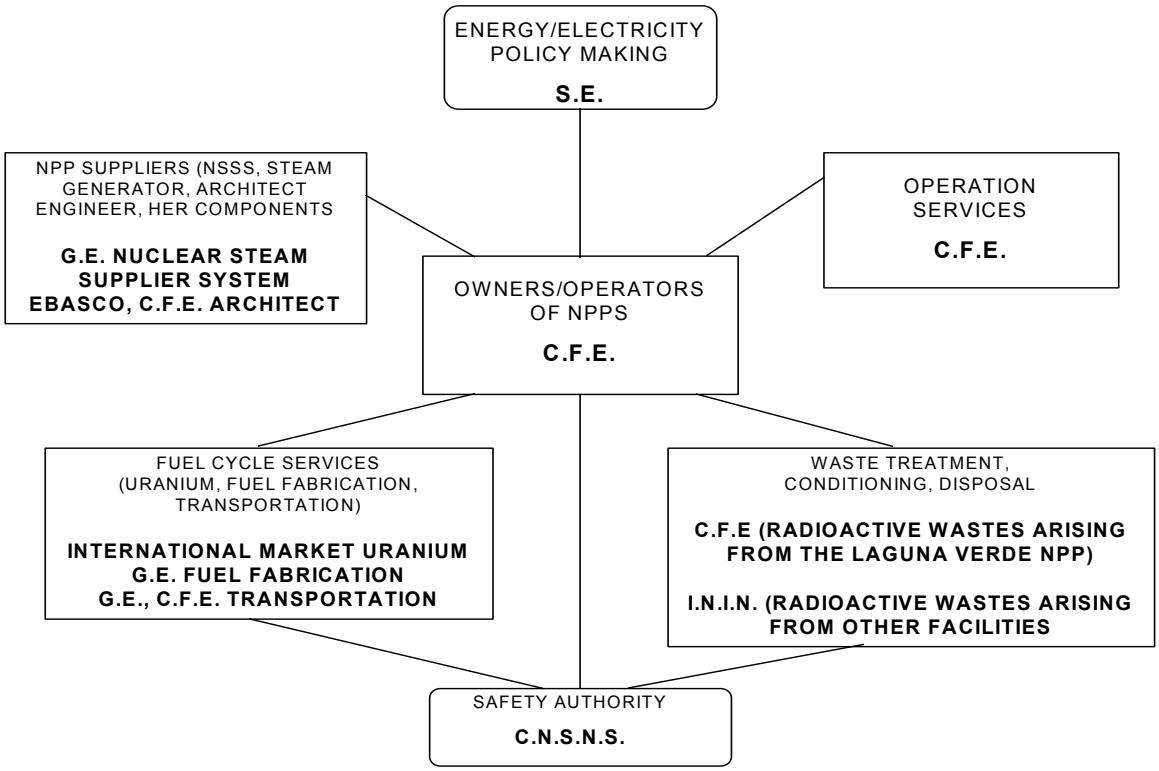
The National Commission for Nuclear Energy (CNEN) was established in 1956 to pave the way for the introduction of nuclear power and nuclear applications in Mexico. CNEN encompassed all the nuclear activities in the country (exploration for uranium, nuclear research, regulation, etc.) but the generation of electricity by nuclear means (which was the sole responsibility of the Federal Electricity Commission (CFE)) and the radioisotopes utilization. Later on the CNEN was transformed into the National Institute on Nuclear Energy (INEN), which redefined the attributes but with very few changes.

In 1979, INEN disappeared and was substituted by three organizations: The National Institute of Nuclear Research (ININ) in charge of all the aspects related to research, Mexican Uranium (URAMEX) in charge of uranium exploration and, eventually, uranium production and the National Commission on Nuclear Safety and Safeguards (CNSNS) in charge of nuclear regulation and safeguards. In 1985, URAMEX disappeared and all its functions passed to the Ministry of Energy.

The interest of Mexico in nuclear power dates back to the early 60's and the first concrete steps were taken in 1966, when a preliminary investigation of potential sites for nuclear power stations was carried out under the auspices of CFE and the National Commission for Nuclear Energy. At the end of the 60's, the government concluded that nuclear power plants might play a major role. In early 1969, CFE decided to invite bids for a 600 MW(e) nuclear power plant of a proven type and invitations to tender were sent to several manufacturers. The bids were received at the beginning of 1970, but the final decision, with up-to-date bids, was taken in the middle of 1972. In 1976, the construction of the Laguna Verde Nuclear Power Plant (LVNPP) was initiated, comprising two reactors of 654 MW(e) net each. The first unit went into commercial operation in 1990 and the second in April 1995.

2.1.2. Current Organizational Chart(s)

Figure 1 shows the structure of the Mexican nuclear power sector.



S.E.	Ministry of Energy
C.F.E.	Federal Electricity Commission
C.N.S.N.S.	National Commission on Nuclear Safety and Safeguards
I.N.I.N.	National Institute of Nuclear Research
G.E.	General Electric
EBASCO	Electric Bond and Share Company

FIG. 1. Organizational Chart

2.2. Nuclear Power Plants: Status and Operations

As mentioned above there is only one nuclear plant in operation with two BWR reactors of 654 MW(e) net each (Table 7). For the time being there are no plans regarding new units or new plants. The National Energy Plan issued in 1990, for the time being is still valid, however it will probably be revised in the near future.

Laguna Verde unit 1 went into commercial operation in 1990, its performance has been quiet good since the very beginning. Unit 2 went into commercial operation in April 1995. With the two units in operation, nuclear energy is expected to account between five and six percent of the total electricity production.

TABLE 7. STATUS NUCLEAR POWER PLANTS

Station	Type	Capacity	Operator	Status	Reactor Supplier
LAGUNA VERDE-1	BWR	680	CFE	Operational	GE
LAGUNA VERDE-2	BWR	680	CFE	Operational	GE

Station	Construction Date	Criticality Date	Grid Date	Commercial Date	Shutdown Date
LAGUNA VERDE-1	01-Oct-76	08-Nov-88	13-Apr-89	29-Jul-90	
LAGUNA VERDE-2	01-Jun-77	06-Sep-94	11-Nov-94	10-Apr-95	

Source: IAEA Power Reactor Information System as of 31 December 2002.

2.3. Supply of NPPs

There are no NPP's suppliers in the country. The main components of the Laguna Verde plant were acquired abroad. At the beginning, the main architect engineer for unit 1 was the Electric Bond and Share Company (EBASCO), but later on, and specially for unit 2, CFE acted as architect engineer with the advice of EBASCO and General Electric (GE).

2.4. Operation of NPPs

The Laguna Verde plant is owned by CFE, the operation and maintenance is done by CFE personnel. In the past, the operator training was done at several similar installations in Spain and the United States. Nowadays, the training is mainly done locally, using the simulator which has been installed at the plant’s premises.

2.5. Fuel Cycle and Waste Management

2.5.1. Fuel Cycle

Mexico is not producing uranium due to the low cost of uranium currently available on the world market. For the next years, the required uranium for reloads of Laguna Verde will be obtained from the world market, since currently there are no plans for producing uranium in Mexico. Some 2,000 tons of uranium reserves have been identified in Mexico, but they are too expensive to exploit considering current prices.

Uranium is bought either as hexafluoride or as concentrate that is converted to hexafluoride by Comurhex in France through a long-term contract. Enrichment is provided by the United States' Department of Energy also through a long-term contract. Fuel fabrication is currently done in the United States by General Electric (GE). Four assemblies supplied by Siemens are being tested in the fourth cycle of Unit 1 of Laguna Verde and there are plans to test also four assemblies supplied by ASEA-BROWN BOVERI (ABB-ATOM) in the near future.

A fuel fabrication pilot plant is almost ready to start operation at the National Nuclear Research Institute using technology provided by General Electric of USA. This pilot plant could produce up to 20 fuel assemblies per year for the Laguna Verde reactors, however after some experience is gained with the operation of the plant and the fuel produced, the plant will probably be shut down since it is not economical to fabricate nuclear fuel at this scale.

As for spent nuclear fuel, the current plans are to store it at the reactors' pools, which have been re-racked to increase the original capacity in order to accommodate the spent fuel that the reactors will produce during their expected operating life. This plan allows time to take a more definite decision depending on future developments in uranium availability and price, expansion of the Mexican nuclear power capacity, new technologies, etc.

2.5.2. Waste Management

A repository exists in Mexico for all the low and intermediate level wastes produced in medical and industrial facilities. This repository will be closed in the near future to avoid social problems due to the population growth in the vicinity.

For the Laguna Verde Plant, the high level waste is being stored at the plant. As for the low and intermediate level waste produced by the plant, detailed site studies are now under way at the same plant site in order to determine the engineering design basis for a "triple barrier" repository using the French approach. The repository is planned to have capacity for the waste generated during the operating life of at least four nuclear reactor units and could also include the waste generated by the medical and industrial facilities in the country.

2.6. Research and Development

The main research centres are the National Institute of Nuclear Research (ININ) and the Electric Research Institute (IIE).

2.7. International Co-operation and Initiatives

Research and development activities carried out jointly with other countries.

1. Agreement of co-operation between the Mexican Electric Research Institute and the Electrical Power Research Institute of the United States of America (USEPRI) for the development and application of the RETRAN-3 Code for NPP's operational transient analysis.
2. Agreement of co-operation between the Mexican Electric Research Institute and the USEPRI in the development and application of the R & R Workstation for NPP's probabilistic risk analysis applications.
3. Agreement of co-operation between the Mexican Electric Research Institute and the USEPRI in the development and application of the MAAP-3 Code for NPP's severe accidents analysis.
4. Agreement of co-operation between the Mexican Electric Research Institute and the USEPRI in the development and application of the CPM-3 Code for the Nuclear data library generation for advanced fuels.
5. Agreement of co-operation between the Mexican Electric Research Institute and the Rensselear Polytechnic Institute of the United States for the development and application of the April Code for NPP's severe accidents analysis.
6. Agreement of co-operation between the Mexican Electric Research Institute and the Cuban Institute for Hydrography for the development of the Northwest Caribbean Sea Oceanographic Chart.

3. NATIONAL LAWS AND REGULATIONS

3.1. Safety Authority and the Licensing Process

The licensing consists of two steps, the first one concludes with the granting of the “Construction Permit” and the second step with the “License for Commercial Operation”. The process starts with the application to build a NPP, by the utility (in Mexico up to now there is a national owned company, called Federal Electricity Commission), presenting to the National Regulatory Body (National Commission on Nuclear Safety and Safeguards) the application itself and the preliminary studies of:

- Siting;

- Environmental impact;
- Quality assurance programme during construction phase.

If these documents satisfy the scope required by CNSNS, the utility is required to present the technical information on the NPP to be built, this information includes the construction procedures and fundamental safety systems to cope with the operational transients and postulated accidents. This information is evaluated by the CNSNS's technical personnel and a set of questions is transmitted to the utility, before the pouring of any concrete at the site. During the Laguna Verde experience, three "Provisional Construction Permits" were granted to CFE before the so-called "Definitive Construction Permit" issue. This limited work authorization has been eliminated in the present procedure for future NPPs.

During the construction itself, the regulatory body inspects the construction of the NPP and has the legal authority to stop the work if the agreed standards are not fulfilled. After the evaluation of the documentation, the regulatory body can issue the "Technical Basis" to grant the construction permit, addressed to the Ministry of Energy, being this the authority allowed by nuclear law, to grant the permit.

At certain stage of the construction and before the start of the pre-operational test period, the utility is required to present to the regulatory body the technical information related with:

- Final design of the station.
- Final site studies.
- Final environmental impact studies.
- Quality assurance programme to the operating phase.
- Final studies on plant performance during transients and postulated accidents.
- Set of operating procedures.
- Operations personnel training programme.
- Pre-operational and start-up test programme.
- Proposed technical specifications.

If these process documents are not clear enough in any technical subject, the regulatory body generates questions to clarify any topic. As a result of this process the regulatory body issues the following documents:

- Permit to load the fuel.
- Set of technical specifications.

The technical basis to grant the operation license, is addressed to the Ministry of Energy, because according the nuclear law, this is the Authority who can grant this kind of documents.

After the fuel load the regulator remains to monitor the performance of the low power test period and any change of power (0 to 5%, 5 to 10%, 10 to 25%, 25 to 50%m 50 to 75% and 75 to 100%), the engineers of the national body review the test results and evaluate possible discrepancies between the acceptance criteria and test results.

3.2. Main National Laws and Regulations in Nuclear Power

Essential legal texts regulating nuclear power in the country

- Constitution of Mexico, Article 27 in force.
- Regulatory Law of Article 27 of the Constitution on Nuclear Matters, published in the official gazette on February 4, 1985.
- Law on Third Party Liability for Nuclear Damage, published in the official gazette on December

31, 1974.
- Radiological Safety Regulations, published in the official gazette on November 8, 1988.
- General Act on Ecological Balance and Environmental Protection, published in the official gazette on January 28, 1988.
- Mexican Official Guidelines NOM-012-STPS-1993, on health and safety at work in premises where ionizing sources are handled, stored or carried, published in the official gazette on June 15, 1994.

Mechanisms in place for financing decommissioning and waste disposal

The mechanisms in force to finance decommissioning and radioactive waste management are the following:

- For wastes proceeding form radioisotope applications, its storage cost is recuperated from the generators of this kind of wastes.
- For low and intermediate level radioactive wastes proceeding from the Laguna Verde Nuclear Power Plant (LVNPP), they will be stored in a repository using the French approach. This repository will be located in the same site.
- For high level radioactive wastes, technology progresses and the future nuclear programme are being expected in order to make a decision for these kind of wastes

The final disposal of radioactive wastes management is a responsibility of the State, in the case of wastes proceeding from LVNPP the Federal Electricity Commission will be in charge of financing its storage. For decommissioning, the State through CFE will be in charge of financing this process.

4. CURRENT ISSUES AND DEVELOPMENTS ON NUCLEAR POWER

4.1. Energy Policy

Nuclear power stations are a proven alternative in Mexico, as demonstrated by the high availability, reliability and safety indicators at Laguna Verde. It is also a realistic option to comply with environmental requirements that are anticipated to be stricter in the future. However, there are no future plans for development of new nuclear facilities in the short term due to the high initial investments required which at the moment are not competitive with those of plants based on natural gas.

The Ministry of Energy is responsible for nuclear fuel cycle policy and operations, and can by law authorize some of these responsibilities to public entities such as the federal electricity commission (CFE) and the national nuclear research institute (ININ).

CFE has been authorized by the Ministry of Energy to negotiate uranium stock purchases, uranium enrichment and fuel fabrication contracts.

An interim waste repository managed by ININ collects all low and intermediate level radioactive wastes produced in medical, industrial and other radioisotope applications. This repository will be replaced by a permanent one in the future. Another interim low and intermediate level radioactive waste repository is operated by the Laguna Verde Plant to handle wastes coming from the station.

Spent nuclear fuel from the Laguna Verde Plant is being stored in the reactor's pools, which have been re-racked to increase the original capacity in order to accommodate all the spent fuel that the reactors will produce during their expected lifetime. This solution gives CFE the time needed to

study all possibilities before adopting a definitive solution, depending on future developments regarding the final disposal of high-level radioactive wastes.

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[13] Estados Unidos Mexicanos Perfil Sociodemográfico, XI Congreso General de Población y Vivienda, Instituto Nacional de Estadística, Geografía e Informática, Garza, Gustavo y Rivera, Salvador.

[14] Dinámica macroeconómica de las ciudades en México, Instituto Nacional de Estadística, Geografía e Informática y Colegio de México, México, D.F., 120 p.p.

[15] Agreements Registerd with the International Atomic Energy Agency, Eleventh Edition, Legal Series N1 3, IAEA, Vienna, Austria, 1993, 278 p.p.

[16] Data & Statistics/The World Bank, www.worldbank.org/data.

[17] IAEA Energy and Economic Data Base (EEDB).

[18] IAEA Power Reactor Information System (PRIS).

Appendix 1

INTERNATIONAL, MULTILATERAL AND BILATERAL AGREEMENTS

AGREEMENTS WITH THE IAEA

• NPT and Tlatelolco related safeguards agreement. INFCIRC No: 197	Entry into force:	14 September 1973
• Additional Protocol	Not signed	
• Improved procedures for designation of safeguards inspectors	Accepted:	27 February 1989
• Supplementary agreement on provision of technical assistance by the IAEA	Entry into force:	4 June 1981
• ARCAL New ARCAL Agreement	Entry into force: Ratification:	April 1988 7 August 2000
• Agreement on the privileges and immunities of the IAEA	Entry into force:	19 October 1983

OTHER RELEVANT INTERNATIONAL TREATIES

• NPT	Entry into force:	21 January 1969
• Tlatelolco	Entry into force:	20 September 1967
• Convention on the physical protection of nuclear material	Entry into force:	4 May 1988
• Convention on early notification of nuclear accidents	Entry into force:	10 June 1988
• Convention on assistance in the case of a nuclear accident or radiological emergency	Entry into force:	10 June 1988
• Vienna convention on civil liability for nuclear damage	Entry into force:	25 July 1989
• Joint Protocol	Non-Party	
• Protocol to amend the Vienna convention on civil liability for nuclear damage	Not signed	
• Convention on nuclear safety	Entry into force:	24 October 1996
• Convention on supplementary compensation for nuclear damage	Not signed	

• Joint convention on the safety of spent fuel management and on the safety of radioactive waste management	Not signed	
• ZANGGER Committee	Non-member	
• Nuclear export guidelines	Not Adopted	
• Acceptance of NUSS codes	Summary: Codes should be used as guidelines in preparation and application of national requirements. Mexican nuclear safety legislation is in conformity with codes	11 April 1990

MULTILATERAL AGREEMENTS

• Standard agreement concerning technical assistance to Mexico	Entry into force: Parties: - United Nations Organization (ONU). - International Labour Organization (ILO). - Food and Agriculture Organization of the UN (FAO). - United Nations Educational Scientific and Cultural Organization (UNESCO). - International Civil Aviation Organization (ICAO). - World Health Organization (WHO). - International Telecommunications Union (ITU). - World Meteorological Organization (WMO). - International Atomic Energy Agency (IAEA). - Universal Postal Union (UPU).	23 July 1963
• Transfer of enriched uranium for a research reactor Parties: Mexico, USA, IAEA	Entry into force:	18 December 1963
• Lease of source material for a subcritical assembly Parties: Mexico, USA, IAEA	Entry into force:	20 June 1966
• Lease of source material for a subcritical facility Parties: Mexico, USA, IAEA	Entry into force:	23 August 1967
• Transfer of a training reactor and enriched uranium Parties: Mexico, Germany, IAEA	Entry into force	21 December 1971
• Second supply agreement for transfer of enriched uranium for a research reactor	Entry into force:	4 October 1972

Parties: Mexico, USA, IAEA

- Supply of uranium enrichment services — Entry into force: 12 February 1974
  Parties: Mexico, USA, IAEA

- Second supply agreement for supply of uranium enrichment services for a second reactor unit — Entry into force: 14 June 1974
  Parties: Mexico, USA, IAEA

- Transfer of title to natural uranium — Entry into force: 23 May 1989
  Parties: Mexico, USA, IAEA

- Plan of operation for a UN Special Fund project in Latin America (Eradication of Mediterranean Fruit Fly). — Entry into force: 29 July 1965
  Parties: Mexico, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, UN Special Fund, IAEA

- Plan of operation for a UNDP project in Latin America, Amendment N1 1. — Entry into force: 31 July 1968
  Parties: Mexico, Costa Rica, El Salvador, Guatemala, Honduras, Nicaragua, Panama, UN Special Fund, IAEA

- Preliminary study of a nuclear electric power and desalting plant. — Entry into force: 7 October 1965
  Parties: Mexico, USA, IAEA

- Agreement concerning provision of a dose assurance service by IAEA to irradiation facilities in its Members States (Exchange of letters). — Entry into force: 18 September 1985
  Parties:
  Mexico, India, Syria, Argentina, Philippines, Malaysia, Belgium, Chile, Switzerland, Egypt, Hungary, Thailand, South Africa, Korea, Republic of, Algeria, Netherlands, Lebanon, Singapore, Denmark, Yugoslavia, Brazil, China.

BILATERAL AGREEMENTS

- Agreement between the Government of the United Mexican States and the Government of Australia concerning co-operation in peaceful uses of nuclear energy and the transfer of nuclear material. Signed on 28 February, 1992, entered into force 1 Oct 1992.

- Agreement between the Government of the United Mexican States and the Government of Canada for Co-operation in the peaceful uses of nuclear energy. Signed in 16 November, 1994, entered into force on 9 May 1995.

Appendix 2

DIRECTORY OF THE MAIN ORGANIZATIONS, INSTITUTIONS AND COMPANIES INVOLVED IN NUCLEAR POWER RELATED ACTIVITIES

NATIONAL ENERGY AUTHORITIES

Ministry of Energy (SE)
Av. Insurgentes Sur N1 552
Col. Roma Sur
México, D.F.
Tel.: +525-564-97-56
Fax: +525-574-10-10
http://www.energia.gob.mx/ingles/index.html

Federal Electricity Commission (CFE)
Salamanca N1 102
Col. Roma
México, D.F.
Tel.: +525-229-54-90
Fax: +525-525-22-35

National Commission on Nuclear Safety and Safeguards (CNSNS)
Dr. Barrag<n N1 779
Col. Narvarte
México, D.F.
Tel.: +525-590-41-81
Fax: +525-590-61-03
Email: cnsns1@servidor.unam.mx

NUCLEAR RESEARCH INSTITUTES

National Institute of Nuclear Research (ININ)
Carretera Federal México-Toluca Km. 36.5
Salazar, Edo. de México
Tel.: +525-521-94-02
Fax: +525-521-37-98
http://www.inin.mx/

Electric Research Institute (IIE)
Av. Reforma N1 113
Col. Palmira
Temixco, Morelos
Tel.: 91 (73) 18-38-11
Fax: 91 (73) 18-25-21
http://www.iie.org.mx/

Instituto de Ciencias Nucleares (UNAM)
http://luthien.nuclecu.unam.mx/

OTHER ORGANIZATIONS

Comisión Federal de Electricidad
http://www.cfe.gob.mx/

Agency for the Prohibition of Nuclear Weapons in Latin America and the Caribbean (OPANAL)
http://www.opanal.org/

Instituto Mexicano del Petróleo (IMP)
http://www.imp.mx/